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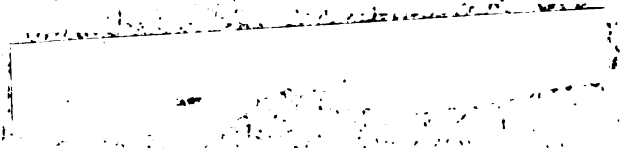

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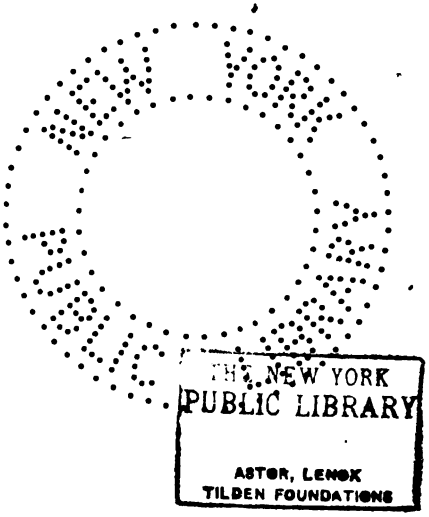
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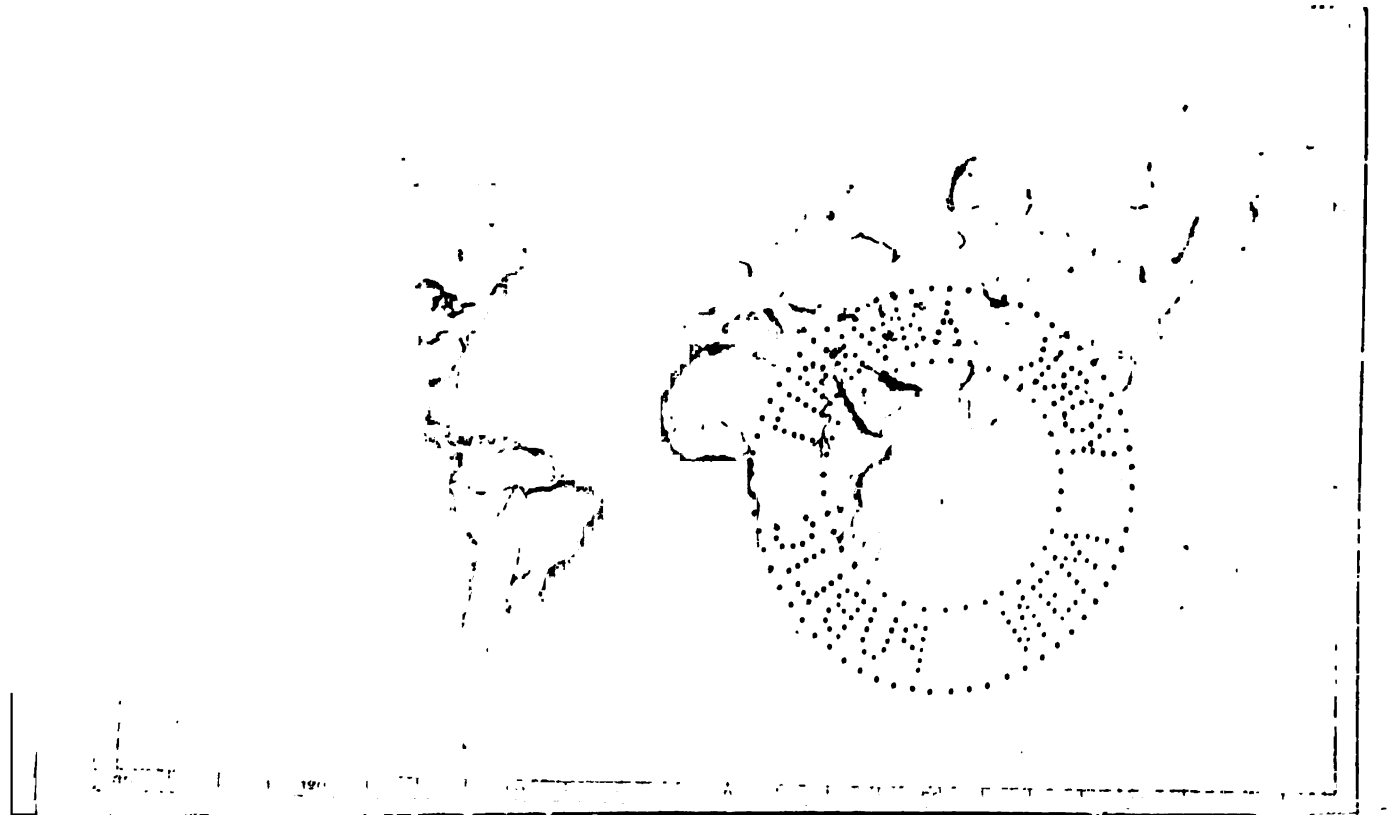

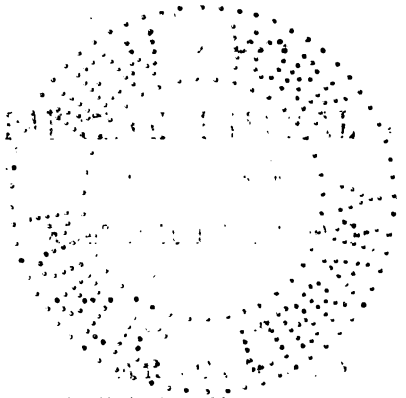

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THE

EARTH AND MAN:

LECTURES ON

COMPARATIVE PHYSICAL GEOGRAPHY,

IN ITS

RELATION TO THE HISTORY OF MANKIND.

BY

ARNOLD GUYOT,

LATE PROF. OF PHYSICAL GEOGRAPHY AND HISTORY, AT NEUCHATEL, SWITZERLAND

TRANSLATED FROM THE FRENCH, BY

C. C. FELTON,

PROFESSOR IN HARVARD UNIVERSITY.

Our Earth is a star among the stars; and should not we, who are on it, prepare ourselves by it for the contemplation of the Universe and its Author? — CARL RITTER.

SEVENTH EDITION, REVISED.

BOSTON:

GOULD AND LINCOLN,

59 WASHINGTON STREET.

1853.

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53683

To C. C. FELTON, Esq.,

Professor in Harvard University, Cambridge.

My Dear Sir,

It is to your friendship that I owe the idea and the possibility of publishing this little work in a language not my own. With rare kindness, and a disinterestedness still more rare, you have placed at my disposal your hours of leisure and your skilful and indefatigable pen. The book is yours already, and I but renew your title to it by begging you to accept this dedication, as a testimony of my heart-felt gratitude, and at the same time as a souvenir of the long but pleasant hours of labor which you have so kindly shared with me to the last.

THE AUTHOR.

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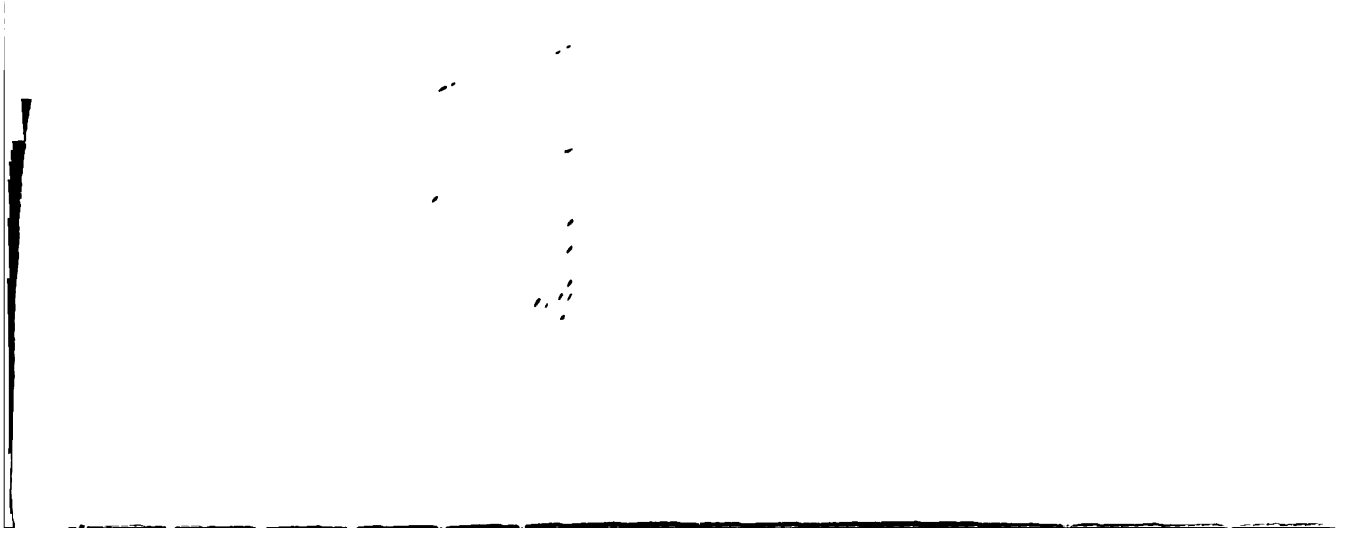

PREFACE.

The lectures contained in the volume here offered to the public were delivered, by invitation, in French, between the 17th of January and the 24th of February, of the present year. One of the halls of the Lowell Institute, in Boston, was placed, for that purpose, at the author's disposal, by the liberality of the Trustee, John A. Lowell, Esq. They were spoken with the help only of a few notes, and were not intended, at the time, for the press. But the publication having been desired by some friends, and requested by the editors of the *Boston Daily Traveller*, for the columns of that excellent journal, the author determined to write out, the next morning, the lecture of the evening before. These rapid pages, translated, from day to day, by Mr. C. C Felton, Professor in Harvard University, are collected and reprinted in the present volume. Neither time nor circumstances have permitted any important alterations; the only material additions are found in the first lecture, the last part of which did not appear in the journal, and, at the beginning of the eighth, the portion which treats of the marine currents. This subject, although announced in the programme of the course, it was found necessary, for want of time, to pass over in silence. As to the rest, the lectures have retained their original cast, notwithstanding the incongruity which sometimes happens, of bringing several different subjects into the same discourse.

This brief history of the present book will place the reader in a position to form a just opinion of the work, and perhaps will induce him to extend to it some indulgence.

It will, moreover, be readily understood, that oral instruction is naturally clothed in forms appropriate to itself, which are not those of a systematic and didactic exposition, such as is required by a book intended only for reading, or for the silent study of the closet. In the opinion of the author, it should bring out in strong relief, even by venturing a dash of the pencil somewhat bold, the essential traits of the subject, in order to fix and deepen the impression, while the secondary features are thrown into the shade. Truth, far from losing by this mode, will gain the advantage of being grasped in a manner at once more distinct and more correct. For nothing is less indispensable to true science, — may the reader of these pages find it so, — than the scholastic and doctoral robe, which is too often unnecessarily worn.

This little work is not, then, a treatise on the subject indicated by its title. The author would wish to consider this unforeseen publication only as the forerunner of a more complete work, the materials of which, gradually collected during long years of study, and still daily accumulating, he hopes to arrange, and work out more at leisure, if not in the same form, at least in the same spirit. However, he is confident that the man of science will find, in this first sketch, the traces of serious and matured studies.

Numerous quotations and references were incompatible with the form of these discourses. The facts, properly so called, are drawn from the common domain of science; and as to the results that have been deduced from their combination, the author willingly leaves to men versed in the subject the task of distinguishing those which may be regarded as constituting a progress in knowledge of the creation, and of its relations to man.

There are, however, three names so closely connected with the history of the science to which this volume is devoted, and with the past studies of the author, that he feels bound to mention them here Humboldt, Ritter, and Steffens, are the three great

minds who have breathed a new life into the science of the physical and moral world. The scientific life of the author opened under the full radiance of the light they spread around them, and it is with a sentiment of filial piety that he delights to recall this connection, and to render to them his public homage.

Notwithstanding the praiseworthy care the publishers of this volume have taken to provide it with the maps and drawings necessary to understand the text, the reader will perhaps desire more. He will find them in the Physical Atlas of Berghaus, the most excellent, and almost the only work of the kind, or in the English publications based on it, by Johnston of Edinburgh, by A. Petermann of London, and others. The explanatory pages give the information necessary for the plates that accompany these sheets. For their execution on stone, the author deems himself happy in having been able to avail himself of the talents of an artist so able and obliging as M. Sonrel.

Besides Prof. Felton, who has read all the proof-sheets, the author returns his sincere acknowledgments to Professors Agassiz, Peirce, and Gray, who have had the goodness to revise portions of them.

Few subjects seem more worthy to occupy thoughtful minds, than the contemplation of the grand harmonies of nature and history. The spectacle of the good and the beautiful in nature, reflecting everywhere the idea of the Creator, calms and refreshes the soul. The view of the hand of Providence, guiding the chariot of human destinies, reassures and strengthens our faith. May these unpretending sheets, launched upon the sea of publicity, reach those who feel the need of both, and by them be kindly received.

CAMBRIDGE, MASS., *May* 1, 1849.

[illegible] TO THE [illegible] EDITION.

[illegible] new and abroad,* [illegible] the duty of care- [illegible] so recent, [illegible] few addi- [illegible] particularly in [illegible] the [illegible] of the [illegible] it was. Not [illegible] exercising a severer crit- [illegible] carefully revised, [illegible] the author seizes this occasion [illegible] render these sheets [illegible].

[illegible] to him who communi- [illegible] it is that of meeting, in the [illegible] many [illegible] cares, an echo [illegible] to the [illegible] numerous testimonies he [illegible]. He finds in these mani- [illegible] his work, and to prepare [illegible] Development of Humanity, [illegible] complement to the present.

* [illegible] London, by Bentley, and an edition [illegible] mutilated edition, called "revised," [illegible] London, in which many passages, [illegible] final edition, and essential to the con- [illegible] conclusions, have been suppressed; [illegible] shown not advanced by the author; [illegible] bad English, all without the least [illegible] first, the author protests; against

EXPLANATION OF THE PLATES AND FIGURES

PLATE I. Physical Map of the World.

This map, in Mercator's projection, is intended to enable the eye to seize at a glance the great physical features of the surface of the globe. To this end, each particular is indicated by a different color. The color of the ocean forms a ground which clearly defines and brings out the characteristic forms of the continents. The bands of white lines which cross them indicate the course of the marine currents, according to the Physical Map of Berghaus. The arrows mark their direction. In the continents, three colors distinguish the three principal forms of relief from each other. The green tint marks the low lands; the white, the more elevated parts and the table lands; the brown, the systems of mountains, the borders of the table lands, and the slopes in general. It is easy thus to form by a single glance an idea of the general features of relief of the different countries of the earth. The dotted lines which cross the map are, beginning at the top, the Arctic circle, the tropic of Cancer, and the tropic of Capricorn. The entirely straight line is the Equator. The latitudes are marked in the margin by a line for every 15°. The longitudes in the same way, by 15° East and West from the meridian of Paris. The two winding lines in the northern half of the map are the isothermal lines of zero Centigrade or 32° Fahrenheit, and of 15° Centigrade or 59° Fahrenheit. All the places situated on these lines, having the same mean annual temperature, set in a clear light the difference of climate between the opposite coasts of the continents, while referring it to the true causes. Every letter has been omitted from this little map, which is intended to be a physical picture, and to speak to the eye. The scale, moreover, scarcely allowed their insertion, and the great features which it represents are so well known that there is no need of naming them.

PLATES II. AND III. (pp. 60, 61.)

These plates contain a series of ideal profiles intended to illustrate the general laws of relief of the continents. The profiles comprise each a transverse zone rather than a simple line, which often would have answered but imperfectly the proposed end. The relation of the heights to the horizontal distances would have to be magnified about one hundred times. The numbers placed in the margin, indicate the heights in thousands of feet. The letters placed at the top of the vertical dotted lines, are the initials of the names of the principal points contained in the tables; when the same initial is repeated, the second in the order of the table is marked thus: ('). The profiles of the massive and entire parts of the continents, comprising the plains and table lands, are distinguished from the heights which surround them, or the mountain chains, by a particular line, by different hatchings, and deeper shading. The peaks, which are merely indicated above the base line, without being connected, are either mountains situated outside of the zone, followed by the profile, as the Carpathian and Mont Blanc, in Europe, Plate II. profile 5; or volcanic peaks, isolated, and affecting the general relief, as the Erdschich, in Asia Minor, Plate II. profile 4, the Ararat, in Armenia, Plate III. profile 1. Plate II. profile 1, the St. Elias, in North America.

Plate II. comprises 7 profiles across the three principal continents of the Old World, in the direction from north to south. In profile 1, Eastern Asia, and profile 6, Africa, the line of horizontal distances having been considerable to be taken into the frame, the profiles are interrupted to indicate that one portion of the horizontal line has been suppressed. In the profile of Eastern Asia the portion omitted is [illegible] equal to the base section. In Africa it is much larger still.

Plate III. comprises the profiles of the New World, from east to [illegible]. Profile 6, parallel above the line of the Antilles, is necessarily [illegible]. But the gradual increase of the reliefs and their disposition [illegible] ought to be considered in reality continuous, [illegible] the points [illegible] covered by the waters of the ocean. The [illegible] in such a manner as to show, at [illegible] reliefs from west to east [illegible] which in the New World. The [illegible].

PLATE IV. Map of the Distribution of Rain.

This map, taken from the Physical Atlas of Berghaus, shows the distribution of rain on the surface of the globe. The deeper the color, the greater is the quantity of rain-water indicated; the deserts are left in white. North and south of the tropics, which are marked by dotted lines, are the regions of continuous, but not abundant rains. Between the tropics, the region of periodical and copious rains. A little north of the Equator a deeper shaded strip indicates the region of calms, where daily thunder storms cause almost throughout the year the fall of a considerable quantity of water.

PLATES V. AND VI.,

Intended to illustrate the law of the degeneration of the human type in leaving the central region of Western Asia, comprise 16 portraits, all drawn from nature, and taken from the plates of the "Animal Kingdom" of Cuvier, wherever a different source is not indicated.

Plate V. *First Series.* From the central regions of Western Asia, to the extremity of Africa, through Arabia and the eastern coast.

No. 1. A Circassian, belonging to the suite of the Persian Ambassador; drawn from the life, at Paris, in 1823, by M. A. Colin.

No. 2. An Arab of Algiers, of the Mozabite tribe; drawn from life, under the direction of Mr. Milne Edwards, by A. Lordon.

No. 3. A negro of Mozambique, on the south-east coast of Africa; drawn from life, in Brazil, by Rugendas.

No. 4. Joshua Makoniane, an old Bassouto warrior, a convert to Christianity, drawn from life by Mr. Maeder, of the French Mission to South Africa. Journal des Missions Evangeliques de Paris, Vol. XX.

Second Series. From Europe to tropical Africa, by the western coast.

No. 5. Portrait of Captain Cook, painted by Dauce, in the gallery of the Naval Hospital at Greenwich. Geographical Almanac of Berghaus.

No. 6. A Cabyle of Flissa, in Algeria; drawn from life by A. Lordon.

No. 7. Senegal Chief, after an unpublished drawing by an officer in the expedition of Captain Laplace.

No. 8. A Negro of Congo; drawn from nature by Rugendas, Voyage Pittoresque au Brésil.

Plate VI. *First Series.*

No. 1. Mongolian type, portrait of one of the Siamese twins, seen in Europe in 1830, after a drawing made from nature, at Paris.

Fig. 2. Mexican, belonging to the group of the Kaukasoff Semokensky, [illegible] in the work of Cuvier, Voyage du Humb.

Fig. 3. New Holland. Portrait of Ouon-Mare, a warrior of the tribe of [illegible] Bay, from the Atlas du Voyage aux Terres Australes.

Fig. 4. A woman of Van Diemen, from l'Atlas de l'Astrolabe.

Fig. 5. North America, from the sources of the Missouri, to Terra [illegible], and the Polar variety.

Fig. 6. Peruvian Indian, portrait taken from the Travels of Prince Maximilian of Neuwied.

Fig. 7. Brazilian Indian, from the banks of the Rio Xipoto, one of the tributaries of the Rio Pomba, in tropical South America, after a portrait by Spix and Martius.

Fig. 8. An inhabitant of Terra del Fuego; Univers Pittoresque.

Fig. 9. Inhabitant of the Aleutian Islands, after Choris; Voyage of [illegible].

Fig. 1, page 41. Land Hemisphere, and Water Hemisphere.

Fig. 2, page 109. Europe at the Silurian Epoch.

Fig. 3, page 109. America at the Coal Epoch.

Fig. 4, page 111. Europe at the Tertiary Epoch.

These three last maps, intended to show the gradual increase of the dry lands, do not so much indicate the real contours of the lands existing at those epochs, this would be impossible,—as the portions which have not since been covered by the waters of the ocean. The white portions are the only dry land. All the portions in ruled lines are under water; but the existing contours of the continents are represented by means of a lighter shade, as a point of comparison. The maps Fig. 2, and Fig. 4, have been constructed after the geological maps of Elie de Beaumont, (in Beaut géologie,) Boué, and Dechen; the map Fig. 3, after the geological map of the United States, by Mr. James Hall, completed by that of Sir Charles Lyell and the geological map of the world, by Boué.

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THE EARTH AND MAN.

LECTURE I.

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LADIES AND GENTLEMEN: —

In asking your attention to a few scientific discourses, in a language not your own, I have not disguised from myself that this circumstance is perhaps a source of embarrassment for some of you, as it certainly is for me. In the communion of mind with mind, in the mutual interchange of ideas, the first condition necessary for establishing between him who speaks and those that hear, the sympathetic harmony which makes its charm, is, that the word shall reach the understanding without obstacle and without effort.

In my favor you have made the sacrifice of your language. I need not tell you, that, on my part, I will

all in my power to render that sacrifice less ir
I shall always be desirous of giving to thos
do me the favor to ask it, all the explanati
they can require.

The subject to which I propose to call you
is Comparative Physical Geography, consid
relations to the history and the destinies of
But the term geography has been applied to
ferent things, the use, the misuse rather to wh
been subjected, has rendered it so elastic and
that, in order to prevent misconception, I m
all explain to you what I understand by *Geog*

If, preserving the etymological sense of
geography, we should, with many authors, u
limit this study to a simple description of the
the globe and of the beings which are found
must at once renounce the idea of calling it by
of science, in the lofty sense of this word. T
without rising to the causes, or descending t
sequences, is no more science, than merely a
to relate a fact of which one has been a witn
geographer who thus understands his study
would be as little of geography as the chronicler
It would be easy to show that even the
describing well ought to be denied him; for
the study of the laws which have pre
over the disposition of the terre
from different points; if he will t
which have given birth to the p
to describe such overwhelmin
of which relative value h

rant, without a guide and without a rule to make a judicious choice in the midst of this infinite variety of partial observations, he remains incapable of mastering them, of grouping them in such a manner as to bring prominently forward those which must give character to the whole, and thus dooms himself to a barren confusion at least; happy, if, in place of a faithful picture of nature, he does not finally profess to give us, as such, the strangest caricature.

No! Geography — and I regret here that usage forbids me to employ the most suitable word, *Geology*, to designate the general science of which I speak — Geography ought to be something different from a mere description. It should not only describe, it should compare, it should interpret, it should rise to the *how* and the *wherefore* of the phenomena which it describes. It is not enough for it coldly to *anatomize* the globe, by merely taking cognizance of the arrangement of the various parts which constitute it. It must endeavor to seize those incessant mutual actions of the different portions of physical nature upon each other, of inorganic nature upon organized beings, upon man in particular, and upon the successive development of human societies; in a word, studying the reciprocal action of all these forces, the perpetual play of which constitutes what might be called the life of the globe, it should, if I may venture to say so, inquire into its physiology. To understand it in any other way, is to deprive geography of its vital principle; is to make it a collection of partial, unmeaning facts, is to fasten upon it forever that character of dryness, for which it has so often and so justly been

reproached. For what is dryness in a science, except the absence of those principles, of those ideas, of those general results, by which well-constituted minds are nurtured?

Physical geography, therefore, ought to be, not only the description of our earth, but the physical science of the globe, or the science of the general phenomena *of the present life of the globe, in reference to their connection and their mutual dependence.*

This is the geography of Humboldt and of Ritter.

But I speak of *the life of the globe*, of the *physiology* of the great terrestrial forms! These terms may perhaps seem here to be misapplied.

I ask your permission to justify them, for I cannot find better, to express what appears to me to be the truth.

Far from me the idea of attempting to assimilate this general life of the inorganic nature of the globe to the individual life of the plant or the animal, as some unwise philosophers have done. I know well the wide distance which separates inorganic from organized nature. I will even go further than is ordinarily done, and I will say that there is an impassable chasm between the mineral and the plant, between the plant and the animal, an impassable chasm between the animal and the man. But this nature, represented as *dead*, and contrasted in common language with *living* nature,

it has not the same life with the animal or
ut, is it then bereft of all life? If it has
, we must acknowledge that it has at least the
rm[illegible] of life. Has it not motion in the water
a and gushes over the surface of the con-

tinents, or which tosses in the bosom of the seas? — in the winds which course with terrible rapidity and sweep the soil that we tread under our feet, covering it with ruins? Has it not its sympathies and antipathies in those mysterious elective affinities of the different molecules of matter which chemistry investigates? Has it not the powerful attractions of bodies to each other, which govern the motions of the stars scattered in the immensity of space, and keep them in an admirable harmony? Do we not see, and always with a secret astonishment, the magnetic needle agitated at the approach of a particle of iron, and leaping under the fire of the Northern light? Place any material body whatsoever by the side of another, do they not immediately enter into relations of interchange, of molecular attraction, of electricity, of magnetism? The disturbance of the equilibrium at one point induces another elsewhere, and the movement is propagated to infinity. And what will it be, if we rise to the contemplation of all the phenomena of this order together, exhibited by a vast country, by an entire continent?

Thus, in inorganic nature likewise, all is acting, all is changing, all is undergoing transformation. Doubtless this is not the life of the organized being, the life of the animal; but is not this assemblage of phenomena also a life? If, taking life in its most simple aspect, we define it as a *mutual exchange of relations*, we cannot refuse this name to those lively actions and reactions, to that perpetual play of the forces of matter, of which we are every day the witnesses. Yes, gentlemen, it is indeed life, but undoubtedly in a very inferior order of things

It is life; the thousand voices of nature which make themselves heard around us, and which in so many ways betray that incessant and prodigious activity, proclaim it so loudly that we cannot shut our ears to their language.

This general life, this physical and chemical life, belongs to all matter. It is the basis of the existence of all superior beings, not as the source, but as the condition. It is in the plant, it is in the animal; only here it is subservient to a principle of higher life of a spiritual nature, of a principle of unity, the mysterious force of which, referring all to a centre, modifies it, controls it, and organizes it, for the benefit of an individual.

Now it is precisely this *internal* principle of unity belonging to organized nature, which is wanting in individuals of inorganic nature; and that is the difference. In inorganic nature, the bodies are only simple aggregations of parts, homogeneous or heterogeneous, and bering among themselves, the combination of which us to be accidental. Nevertheless, to say nothing of law that assigns to each species of mineral a par- ar form of crystallization, we see that every aggrega- fortuitous in appearance, may constitute a whole, limits, and a determinate form, which, without ything of absolute necessity, gives to it, how- lineaments of individuality. Such are the phical regions, the islands, the peninsulas, ntilles, for example, England, Italy, nerica. Each of these terrestrial a whole, as an individual, has a of its parts, of the forms which

belong only to it, a situation relatively to the rays of the sun, and with respect to the seas or the neighboring masses, not found identically repeated in any other.

All these various causes excite and combine, in a manner infinitely varied, the play of the physical forces inherent in the matter composing them, and secure to each a climate, a vegetation, and animal life; in a word, an assemblage of physical characters and functions peculiar to it, and really giving it something of individuality.

It is in this sense that we shall speak of the great geographical individuals, that we shall be able to define them, to indicate their characters, to mark their differences; in a word, to apply to them that comparative study, without which there is no true science. But let us not forget that these individuals have the cause of their existence, not *within*, like organized beings, but *without*, in the very circumstances of their aggregation. Hence, gentlemen, the great importance of external form; the importance of the geographical forms of contour, of relief of the terrestrial surface; of the relations of size, of extent, of relative position. In considering them simply in a geological point of view, it may appear quite accidental that such a plain should or should not have risen from the bosom of the waters; that such a mountain rises at this place or that; that such a continent should be cut up into peninsulas, or piled into a compact mass, accompanied by, or deprived of, islands. Finally, we reflect that a depression of a few feet, which would make no change in the forms of the solid mass of the globe, would

at part of Asia and of Europe to disappear
: water of the oceans, and would reduce
a few large islands, we might be led to the
hat the external shape of the continents has
siderable importance.
hysics, neither of these circumstances is
. Simple examples, without further dem-
rill be sufficient to set this in a clear light.
estion of the forms of contour? Nothing
Europe better than the variety of its
of its peninsulas, of its islands. Suppose,
nt, that beautiful Italy, Greece with its
elago, were added to the central mass of
and augmented Germany or Russia by the
uare miles they contain; this change of
ot give us another Germany, but we should
and a Greece the less. Unite with the
pe all its islands and peninsulas into one
, and instead of this continent, so rich in
nts, you will have a New Holland with
lty.
to the forms of relief, of height? Is it a
ference whether an entire country is lifted
cold regions of the atmosphere, like the
of Asia, or is placed on the level of
nder the same sky, the warm and fer-
dorned with the brilliant vege-
cold and desert plateaus of
burning region of Vera Cruz
lofty plains of Mexico and its
immense forests of the Amazon,

where vegetation puts forth all its splendors, and the desolate paramos of the summits of the Andes, and you have the answer.

And the relative position? Do not the three peninsulas of the south of Europe owe to their position their mild and soft climate, their lovely landscape, their numerous relations, and their common life? Is it not to their situation that the two great peninsulas of India are indebted for their rich nature, and the conspicuous part one of them, at least, has played in all ages? Place them on the north of their continents, Italy and Greece become Scandinavia, and India a Kamtschatka.

All Europe is indebted for its temperate atmosphere to its position relatively to the great marine and atmospheric currents, and to the vicinity of the burning regions of Africa. Place it at the east of Asia, it will be only a frozen peninsula.

Suppose the Andes, transferred to the eastern coast of South America, hindered the trade wind from bearing the vapors of the ocean into the interior of the continent, and the plains of the Amazon and of Paraguay would be nothing but a desert.

In the same manner, if the Rocky Mountains bordered the eastern coast of North America, and closed against the nations of the East and of Europe the entrance to the rich valley of the Mississippi; or if this immense chain extended from east to west across the northern of this continent, and barred the passage of the polar which now rush unobstructed over these vast —let us say even less: if, preserving all the gre features of this continent, we suppose only

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of view, we must rise to a higher position. We must elevate ourselves to the moral world to understand the physical world; the physical world has no meaning except by and for the moral world.

It is, in fact, the universal law of all that exists in finite nature, not to have, in itself, either the reason or the entire aim of its own existence. Every being exists, not only for itself, but forms necessarily a portion of a great whole, of which the plan and the idea go infinitely beyond it, and in which it is destined to play a part. Thus inorganic nature exists, not only for itself, but to serve as a basis for the life of the plant and the animal; and in their service it performs functions of a kind greatly superior to those assigned to it by the laws which are purely physical and chemical. In the same manner, all nature, our globe, admirable as is its arrangement, is not the final end of creation; but it is the condition of the existence of man. It answers as an instrument by which his education is accomplished, and performs, in his service, functions more exalted and more noble, than its own nature, and for which it was made. This superior being then solicits, so to speak, the creation of the inferior being, and associates it to his own functions; and it is correct to say that inorganic nature is made for organized nature, and the whole globe for man,

de for God, the origin and end of all

rds the whole of created things,
parts of which are closely con-
pose each other.

of view, the earth, and all it

[illegible] particular, with the whole of [illegible] the forms they present, acquire [illegible]

[illegible] man, and the theatre for the [illegible] ; is is the means of the edu- [illegible], that we shall have to consider [illegible] the value of each of the physical [illegible]

[illegible] we may now [illegible] two-fold domain [illegible], we ought to show that the parts [illegible] of the globe, in the [illegible] great differences. [illegible] South America, Africa,—I [illegible]—and South [illegible] of either of the great [illegible] exercised an influence [illegible]. There are times very near [illegible] has rarely passed the [illegible]. Upon these two [illegible] all the interests of the [illegible] arts and spec- [illegible] that of North [illegible] itself to [illegible]

[illegible] these shores alone. It [illegible] that of the na- [illegible] of nature, and [illegible] the necessities of [illegible] almost infinite [illegible] render it [illegible] and the root

of that immense tree which is now bearing such beautiful fruits.

But Asia has yielded to Europe the sceptre of civilization for two thousand years. At the present day, Europe is still unquestionably the first of the civilizing continents. Nowhere on the surface of our planet has the mind of man risen to a sublimer height; nowhere has man known so well how to subdue nature, and to make her the instrument of intelligence. The nations of Europe, to whom we all belong, represent not only the highest intellectual growth which the human race has attained at any epoch, but they rule already over nearly every part of the globe, and are preparing to push their conquests further still. Here, evidently, is the central point, the focus where all the noblest powers of humanity, in a prodigious activity, are concentrating themselves. This part of the world is, then, the first in power, the luminous side of our planet, the full-grown flower of the terrestrial globe.

And yet what a contrast between this moral grandeur and the material greatness of this, the smallest of the continents! Nothing in it strikes us at the first glance. Europe does not astonish us by those vast areas which the neighboring continent of Asia embraces. Its loftiest mountains scarcely reach to half the height of the Himalayas. Its plateaus, those of Bavaria and Switzerland, deserve the name, by the side of those of Tibet. Its peninsulas, what are they in comparison with India and Arabia, each of which forms a continent! Its seas, the Mediterranean and its dependencies, destroy the proportions of the vast

[illegible] Asiatic peninsulas. Nowhere [illegible] these immense streams, that water [illegible] Asia and America, and are their [illegible] which cover immeasurable to man; [illegible] terrible aspect, [illegible] their immensity. We [illegible] luxuriousness of the tropics [illegible] Siberia: we feel [illegible] equator, nor [illegible] organic life. [illegible] same modifications to the [illegible] regions of [illegible] insects nor the [illegible] which [illegible] plumage [illegible] light of [illegible] and tem-

[illegible] with the bril- [illegible] the other con- [illegible] development of [illegible] nature of this [illegible] Or may [illegible] such modest [illegible] have re- [illegible] may so distin- [illegible] This is a [illegible] just, the

But a third continent, unknown in the history of ancient days, North America, has also entered the list, and is advancing with giant steps; for it has not to recommence the work of civilization; civilization is transported thither ready made. The old nations of Europe, exhausted by the difficulties of every kind which oppose their march, turn with hope their wearied eyes towards this new world, for them the land of the future. Men of all languages, of every country, are bringing hither the most various elements, and preparing the germs of the richest growth. The simplicity and the grandeur of its forms, the extent of the spaces over which it rules, seem to have prepared it to become the abode of the most vast and powerful association of men that has ever existed on the surface of the globe. The fertility of its soil; its position, in the midst of the oceans, between the extremes of Europe and of Asia, facilitating commerce with these two worlds; the proximity of the rich tropical countries of Central and South America, towards which, as by a natural descent, it is borne by the waters of the majestic Mississippi, and of its thousand tributary streams; all these advantages seem to promise its labor and activity a prosperity without example. It belongs not to man to read in the future the decrees of Providence. But science may attempt to comprehend the
[illegible] of God, as to the destinies of nations, by exam-
[illegible] care the theatre, seemingly arranged by Him
[illegible]ion of the new social order, towards which
[illegible]g with hope. For the order of nature
[illegible]s of that which is to be.
[illegible]n, are the great problems our study

the education of man, and the realization of the plans of Mercy for his sake!

Be pleased always to remember, in my favor more than for yourselves, that the path of science is often difficult and beset with rugged cliffs. The traveller doubtless gathers many flowers on the way. But the tree of Science, which bears the noblest fruits, is placed high up on precipitous rocks. It holds out to our view these precious fruits from afar. Happy he who by his efforts may pluck one of them, even were it the humblest. He values it, then, by what it has cost him. I have made the attempt, and this fruit I offer to you. In default of beauty, may you find therein the savor that I have tasted myself.

After what we have just said of the importance of the geographical forms of the crust of the globe, you will not be surprised, gentlemen, that these very forms of contour and relief, although so far entirely outside, and the arrangement of the great terrestrial masses, are to be the first subject to occupy our attention.

Each of these masses is a solid, of which we are not able to ascertain the configuration, except by considering

it ...ntal dimensions and in its vertical

its extent and in its contours;

...s of relief which its surface presents.

...t of view, and that of their

...st first of all study them.

...nts, as they are shown by

...are nothing else than the

...ntact between the lands and

the horizontal surface of the oceans. This line is a true curve of level, the sinuosities of which depend entirely upon the plastic forms of the continent itself. It would change its form completely by the relative depression or elevation of the seas. Such as it is, it presents us an almost infinite variety of bends in and out, which at the first glance seem perfectly irregular and accidental. Yet a more attentive study, and a comparison of the characteristic figures of the continents, enable us to perceive certain features of resemblance and a general disposition in their parts which seem to indicate, as we shall see hereafter, the existence of a common law which must have presided over their formation.

These grand analogies and these characteristic differences of form and grouping, simple and evident as they appear to us when they have once been pointed out to our attention, have nevertheless been discovered only by [illegible] and successively, by the most eminent minds.

I [illegible] the researches of the physical sciences, first [illegible] by ascertaining that the southern extremities of the [illegible] terminate in a point, turned towards the [illegible], while they go on widening towards the north.

[illegible] Humboldt, [illegible] the learned and judicious [illegible], in his second voyage round the world, and on this [illegible] developed it to a [illegible] points are substantially three [illegible] in the structure of the [illegible]

[illegible] the southern points of all the continents [illegible] in the extremi-

ties of mountain belts, which come from far in the interior, and break off abruptly, without transition, at the shore of the ocean. Thus America, which terminates in the rocky precipices of Cape Horn, the last representatives of the already broken chain of the Andes; thus Africa, at the Cape of Good Hope, with its high plateaus and its Table Mountain, which rises from the bosom of the ocean to a height of more than 4,000 feet; thus Asia, with the peninsula of the Deccan, which sends out the chain of the Ghauts to form the high rocks of Cape Comorin; Australia, lastly, whose southern extremity presents, at Cape Southeast, of Van Diemen's Land, the same abrupt and massive nature.

A second analogy is, that the continents have, east of the southern points, a large island, or a group of islands more or less considerable. America has the Falkland Islands; Africa, Madagascar and the volcanic islands which surround it; Asia has Ceylon; and Australia, the two great islands of New Zealand.

A third peculiarity of configuration, common to these same parts of the world, is a deep bend of their western side towards the interior of the continent. On this side their flanks are as if hollowed into a vast gulf. In America, the concave summit of this inflection is indicated by the position of Arica, at the foot of the high Cordillera of Bolivia. In Africa, the Gulf of Guinea expresses more strongly still this characteristic feature. It is more feebly marked in Asia by the Gulf of Cambaye, and the Indo-Persian Sea; it reappears fully in Australia, where the Gulf of Nuyts occupies almost the whole southern side.

...per did not stop here. Seeking to explain to him-
...f these remarkable coincidences in the structure of
...e great continental masses, he arrived at the conclusion
...at they were due to a single cause, and that this cause
...as a great cataclysm coming from the south-west.
...e waters of the ocean, dashing violently against
...e barrier the continents opposed to them, ground
...ay their rocks with fury, scooped out the deep gulf
...ed towards the south-west, swept off all the movable
...ass from the southern side, and left nothing standing
...ut those vast rocks that formed only the skeleton.
...hich, in the end would be only the accumulated
...ass of the great destruction, or the pieces of the conti-
...ent which, with destruction by the jutting point
...ere carried on the rocks.

...is theory, as it is ingenious, was admitted
...y many distinguished contemporaries of
...im; others, the celebrated northern
...ave this general cataclysm from
...which seems to him to explain the great
...he has observed in the north of
...Europe and of Asia,
...ains on the north, of

...him, would be com-
...countries, trans-
...y them deposited
...n spent upon the
...Asia. It is thus
...eria of fossil ele-

phants and of mammoths, and a multitude of other animals and plants which live at the present day only under the sky of the tropics. He remarked, moreover, in support of this hypothesis, that the disproportion existing between the extent of the part of Asia situated south of the Himalaya, compared with that of the vast plains which flank the north of the central mass of the continent, seems to indicate that a great portion of these southern regions has been carried away by this great flood. Pallas, lastly, applies the same observation to America, the western part of which is reduced to a narrow strip, while the region east of the Andes makes almost the whole of the continent.

Seductive as this idea is at the first glance, it is scarcely necessary to say that all that modern geology has taught upon the structure of the mountains, their rise, and the composition of the soil, forbid us to adopt it. It dates from a period when the mind, struck for the first time with the revolutions of the globe, of which it saw the traces everywhere, found no force sufficiently powerful to bring them about, and when water, in particular, seemed the only agent that could be resorted

[illegible]on. Nevertheless, it has the merit
[illegible] and of fixing, in a precise manner,
[illegible]ts, the existence of which is incon-

boldt also shows that he is
enomena of the configuration
y destined to reveal the secret
irst calls our attention to the
ing between the two sides

which unites them is long and narrow. The archipelago on the east, that of the Antilles, is considerable; the peninsula on the west, California, without being greatly extended, is clearly outlined.

The two other double worlds are less regular, less symmetrical. First, the component continents are of unequal size; then the two northern continents are united, and, as it were, joined back to back. Steffens divides them by a line passing through the Caucasus, and coming out upon the Persian Gulf. He thus recombines with Europe a part of Western Asia and Arabia, and gives Africa for its corresponding continent. They are united by the Isthmus of Suez, the shortest and most northern of all. The peninsula found on the east is Arabia, which is of considerable size; the archipelago on the west is that of Greece, which is comparatively of small importance.

This relation is evidently, gentlemen, as you will agree, a forced one. But it seems to me that it would be easy to reëstablish the analogy, so far as the irregularity of structure in the European continent permits, by considering Italy and Sicily, which almost touch Africa by Cape Bon, as the true isthmus. The archipelago is then found on the east, according to the rule, and the peninsula, Spain, on the west.

The third double world, Asia-Australia, is more normal; it approaches nearer the type. The isthmus which unites them is broken, it is true. But that long, continuous chain of islands, stretching without deviation from the peninsula of Malacca, by Sumatra, Java, and the other islands of the Sonde, to New Holland, offers

so striking an analogy and parallelism to the isthmus which unites the two Americas, that, before Steffens, Ebel and Lamark had already pointed it out. The great archipelago of Borneo, Celebes, and of the Moluccas, corresponds to that of the Antilles; the peninsula of India, to California.

Here the disproportion between the two continents, as to their extent, is pushed to the extreme. Asia-Australia presents the union of the greatest and the smallest of the terrestrial masses.

These three double worlds exhaust the possible combinations of relations between their component continents. In America, that of the north and that of the south are equal in form and in power; there is a symmetry. In the two others they are unequal. In Europe-Africa, the northern continent is the smallest. In Asia-Australia, it is the continent of the south.

These views of Steffens, even without being justified a physical theory of the phenomena, are not the less high interest, and lead us to consider the grouping of continents under a point of view of the application which we shall by-and-by see the utility.

t none of the authors who occupied themselves these questions of configuration and of grouping of rrestrial spaces, has done so in a manner more and more fruitful in important results, than Carl

founder of historical geography, in the high sense ttached to the word, this learned scholar, ography to the rank of a philosophical t he has breathed into it, applied him-

self chiefly [illegible] conditions [illegible] favourable [illegible] This novel [illegible] relations [illegible] cognizance [illegible] manner [illegible] groupings [illegible] the course [illegible]

Ritter showed [illegible] ous in the northern [illegible] southern, but that [illegible] through the coast [illegible]

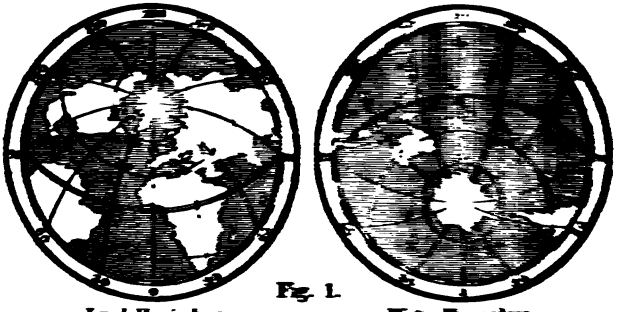
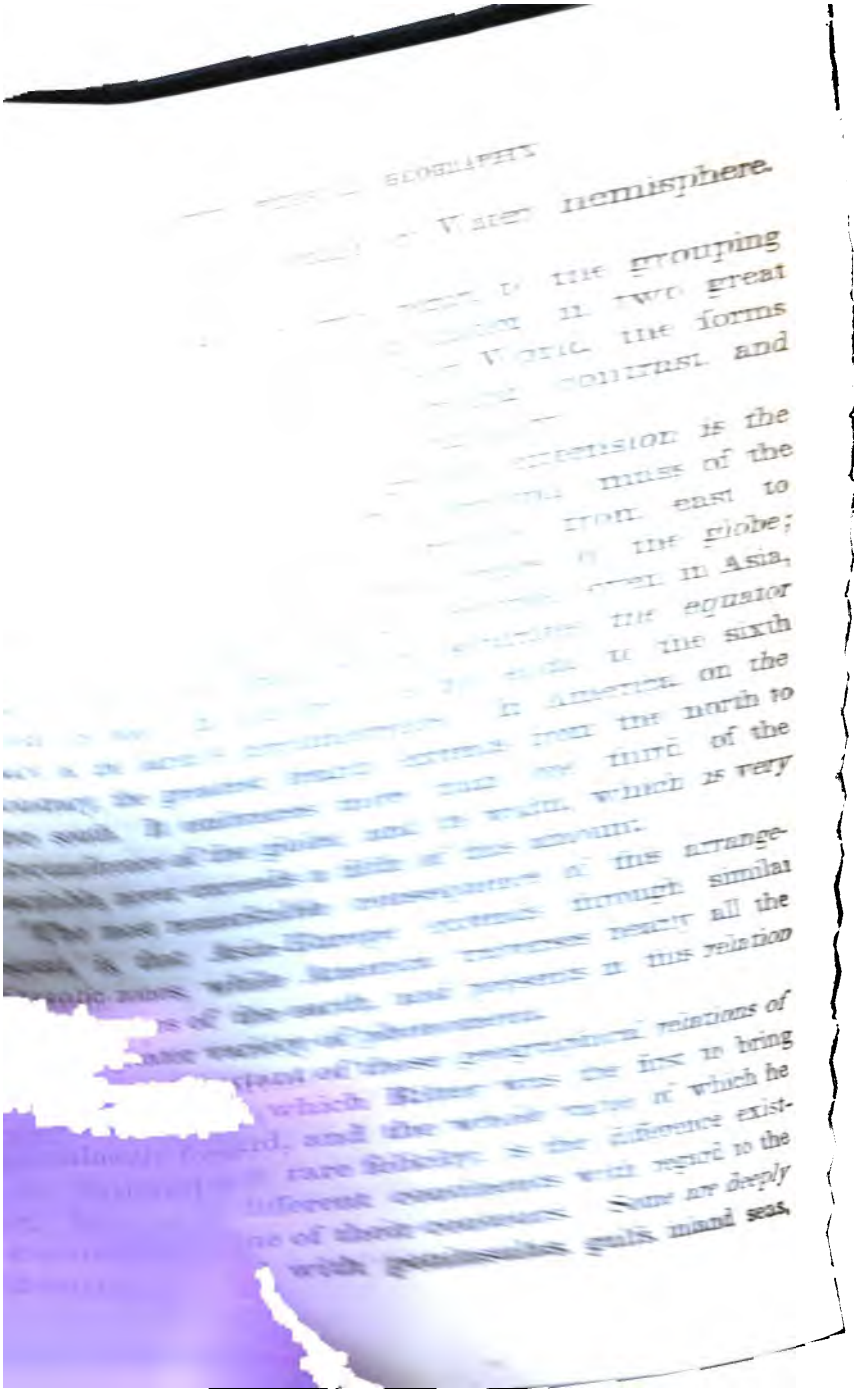


Fig. 1.

Land Hemisphere. *Water Hemisphere.*

surface of the globe is found to be divided into two hemispheres, the one containing the most extensive terrestrial masses, those nearest together and most important; while we behold, in the other, only vast oceans, in which float here and there the peninsular extremities of the principal lands, narrowed and dispersed, and Australia, the smallest and most isolated of the continents. One is then the Continental or Land hemi-



which give to the line of their coasts a great length. Others present a mass more compact, more undivided; their trunk is, as it were, deprived of members, and the line of the coasts, simple and without numerous inflections, is comparatively much shorter.

Considered under this aspect, the three principal continents of the Old World form a remarkable contrast.

Africa is far the most simple in its forms. Its mass, nearly round or ellipsoidal, is concentrated upon itself. It thrusts into the ocean no important peninsula, nor anywhere lets into its bosom the waters of the sea. It seems to close itself against every influence from without. Thus the extension of the line of its coasts is only 14,000 geographical miles, of 60 to the degree, for a surface of 8,720,000 square miles; so that Africa has only one mile of coast for 623 miles of surface.

Asia, although bathed on three sides only by the ocean, is rich, especially on its eastern and southern coasts, in large peninsulas, as Arabia and the two Indies, Corea, Kamtschatka. Whole countries push out into the ocean, as Mandchouria and China. Nevertheless, the extent of this continent is such, that, in spite of the depth of the indentations, there yet remains at its centre a greatly preponderating mass of undivided land, which commands the maritime regions as the body commands

nbs. Asia is indebted to this configuration for a

of coast of 30,800 miles; it is double that of Africa,

is, nevertheless, only one third smaller. Asia

; possesses a mile of coast to 459 square mil

e.

the continents, Europe is the one whose f

of contour are most varied. Its principal mass is deeply cut in all parts by the ocean and by inland seas, and seems almost on the point of resolving itself into peninsulas. These peninsulas themselves, as Greece, Scandinavia, repeat to infinity the phenomena of articulation and indentation of coasts, which are characteristic of the entire continent. The inland seas and the portions of the ocean its outer limbs enclose, form nearly half of its surface. The line of its shores is thus carried to the extent of 17,210 miles, an enormous proportion compared with its small size; for it is 3,210 miles more than Africa, which is nevertheless three times greater. Europe enjoys one mile of coast for every 156 square miles of surface. Thus it is the continent most open to the sea for foreign connections, at the same time that it is the most individualized, and the richest in local and independent centres.

In this regard there is, as we see, a sensible gradation between even the three principal continents of the Old World. [illegible] most simple; it is a body without members, [illegible] branches. Asia is a mighty trunk, [illegible] ters of which, however, make only a [illegible] one, the members overrule the [illegible] s cover the trunk: the peninsulas of its entire surface. Africa [illegible] sia opens only its margins; [illegible] rely, and is the most acces-

[illegible] he continents, although in a less [illegible] America, like Europe, is more [illegible] America, the configuration of

which, in the exterior at least, reminds us of the forms of Africa, and the uniformity of its contours. The two continents of the New World are more alike. Nevertheless, the line of the shores is much more extended in North than in South America. It is 24,000 miles in the former, or one mile of coast to 228 square miles of surface; in the latter, it is 13,600 miles, or a mile of coast for 376 miles of surface.

The following table represents these differences of configuration of the continents by numerical proportions. The mile here employed is the geographical mile, of 60 to the degree. It is the only one we shall make use of in the course of these lectures.

Countries.	Surface in square miles of 60 to a degree.	Length of line of shores.	Square miles for 1 mile of coast.
Europe, ...	2,688,000	17,200	156
Asia, ...	14,128,000	30,800	459
Africa, ...	8,720,000	14,000	623
Australia, ...	2,208,000	7,600	290
North America, . .	5,472,000	24,000	228
South America, . .	5,136,000	13,600	376

It is to Ritter, moreover, as well as to Humboldt, that ence is indebted for the appreciation of the value of relations of size, of relative position of each of the nents, the influence of which, in nature and in , will appear constantly greater the further we e in our inquiries.

exposition we have just made has shown us at erences and analogies in the forms and dis

position of the continental or land masses. The differences prove that each Continent or each group of continents has a character peculiar to itself, and in some sort individual. The analogies lead us to suspect the existence of a general law: they disclose an arrangement which cannot be without a purpose; now, this purpose it will be our duty to seek to comprehend, if we would attain to the true understanding of this part of Creation.

LECTURE II.

Recapitulation — Vertical dimensions or forms of relief — Difficulties presented by their study — Usefulness of profiles — Great influence of differences of height — Elevations in mass, and linear elevations — Importance of the former — Labors of Humboldt and Ritter on this subject — Examination of the general features of relief of the continents — A great common law embracing them all.

LADIES AND GENTLEMEN: —

The conclusion of the preceding lecture was devoted to a simple examination of the most prominent forms which the continents present to us, and such as the line of contact of the lands with the horizontal surface of the oceans exhibits to the eye. In this first review, we have followed, step by step, in their discoveries, the men of science who were the first to point them out. We have recognized, with Lord Bacon and Forster, the tapering form of the southern points of the continents, their gulfs on the west, and their islands on the east; with Pallas, the situation of the great plains in the north of the Old World, and the east of the New; with Humboldt, the winding forms and parallel shores of the great oceanic valley bearing the name of the Atlantic; with Steffens, the enlargement of all the lands towards the north, and the characteristic grouping of the continents in three double worlds. Ritter, finally, has shown us how almost all the lands are combined in one hemisphere, which may be contrasted as a continental

of their horizontal forms, and moulding in such various manners the different countries of the globe. It is only after having considered the continents under this second point of view, that we shall have the elements necessary to understand the great phenomena of the life of the globe.

But a great difficulty of this study is, that the eye cannot distinguish the elevations on the maps, as well as the contours; besides, physical maps are still wanting for a great part of the earth, and have only been made by nations the most advanced in civilization. In this regard, America deserves to have one of her own, and every friend of science should lend the aid of his good wishes to the accomplishment of so desirable a result.

To remedy these difficulties, we must avail ourselves of profiles. You will easily understand what a profile is, by casting a glance at the plaster model before you, representing one of the most rugged and broken parts of the Swiss Ju[illegible]. If, cutting it perpendicularly in its [illegible] ourselves in front of the section, the [illegible]edge of the surface will present you [illegible] kind which we shall make use of. It [illegible]st interest to preserve, in these sect[illegible] n between the heights and the hor[illegible] it is in nature; but it is not pr[illegible] making use of drawings on a [illegible]en it is intended to represent [illegible] of the terrestrial surface. If, [illegible]ake transverse sections of an [illegible]nt of the horizontal dimensions,

are the only wealth of the mountaineer, for whom industry ceases to be a resource. Higher still, vegetation disappears, with it the animals, and soon, instead of the smiling pictures of the plain and the lower valleys, succeeds the spectacle of the majestic but desolated regions of eternal ice and snow, where the sound and animation of life give place to the silence of death.

In truth, all the life of the globe is spread on the surface, and the whole space comprised between the bed of the oceans and the regions of the atmosphere, habitable for organized beings, forms only a thin pellicle round the enormous mass of our planet.

The physical position of a place, as I would call its altitude, or its elevation in the atmosphere above the level of the seas, is, then, the necessary complement of its geographical position. In considering only places situated in a region of small extent, this element is even far the most important to know.

Although the forms of relief are infinitely varied, it seems to me that we may refer them to two great classes, admitting of numerous modifications.

1. The elevations in mass, and by great surfaces, which are called *plains*, or *lowlands*, when they are ele-
ed only a little above the level of the oceans, and
or *table lands*, when their elevation is more
le, and presents a solid platform, a basis of
ess.
lear elevations and the chains of mountains,
istributed over the surface and on the bor-
lains and of the table lands, or more rarely
solated groups.

three forms, those which strike us most at
nce, are the mountains; and so the geogra-
occupied themselves with these in the first
che, of the French Academy, in the middle
entury, was the first who attempted to com-
ematic order the whole of the mountains of
t he was too often obliged to supply by imag-
ant of positive knowledge; and I mention
r on the connection of the mountains of the
point out the first step that was taken in
er him, Buffon made the important observa-
principal mountain chains of the Old World
ection of the parallels, and those of the
he direction of the meridians; and that
chains follow the inverse in both.
tion for the mountains lasted a long time;
it it still prevails in geology. Although
the great surfaces, horizontal or slightly
vation of entire continents, may be per-
ntial fact in the physical history of our
of a chain of mountains; nevertheless,
rely occupied itself except with the
almost ready to admit that the upheaval
ns is the principal fact, and that of the
l of the plateaus the accompaniment.
ce to discuss this great question, but
say, that at all events in physical
not be of this opinion.

[illegible] was introduced into science
[illegible] of these elevations in mass
[illegible] was not recognized in reality
[illegible] Humboldt. He was the

first to bring prominently out by his barometrical sections, the remarkable forms of the plateaus of Mexico and of the high valleys of the Andes. No one of the great physical consequences connected with this structure escaped his penetrating sagacity. After him it was not allowed to neglect the important element of the altitudes, and this great truth remained an acquisition to science.

Carl Ritter soon after applied these principles to the study of all the continents. Drawing from the treasures of his vast erudition, he availed himself of all the documents scattered over thousands of volumes, to give us a true image of the structure of the continents. He distinguished with greater precision the high plateaus of Central Asia and of Western Asia from the low lands which surround them; he exhibited the contrast between the high lands of Southern Africa, and the low plains of the Nile and of Sahara. Each of the countries of the Old World under this new light appeared to our eyes for the first time in its true form, as those of the New World had been revealed by Humboldt.

For a long time still we shall have to persevere in this path which genius has opened, in order to complete by observation the work so happily begun. But have we nother step to take? Shall we not find here, in dst of this infinite variety of forms of relief, some grand analogies which have struck us in the the horizontal forms, some of those general ich authorize us to admit for the elevations, great common law around which the partic- arrange themselves?

ll endeavor to solve this important question,

not, gentlemen, by any hypothesis, but by the combin
tion and comparison of the figures recognised in scienc
For this purpose I may often be obliged to quote figure
but even figures have their eloquence. These, for great
convenience, I shall express in round numbers, as it wi
sufficiently answer the end I propose.

The examination of the general reliefs of the grea
masses of dry land on the surface of the globe, leads u
in fact, to the recognition of certain great analogie
certain great laws of relief, which apply, whether to cer
tain groups of continents, or to all the continents take
together, or to the whole earth. I shall point out, on
after another, these general facts, supporting them by
examples; and, with the aid of the profiles you hav
before you, I hope to make clear to you the general law
which appears to me to follow from them.

1. All the continents rise gradually from the shores of
the seas towards the interior, to a line of highest eleva
tion of the masses, and of the peaks surmounting them
maximum of swell.

fact appears trivial in the stating, because it
much according to the nature of things. But
so for him who knows the geological history of
the revolutions their surface has
estion is asked, why we should
ior of vast continents like Asia or
depression, the bed of which should
urface of the oceans. And in fact
not absolutely wanting to our con-
, as a case of the kind, the great
which is occupied by the Caspian
he surface of this sea, and even of

a great part of the surrounding countries, is below the common level of the oceans; further, its basis presents in its southern parts considerable depths. The valley of the Jordan and Dead Sea, together with its lakes and the river, is almost entirely below the level of the Mediterranean. The recent measurements of Bertou, of Russegger, and of several others, among whom I will mention, as the most recent of these bold explorers, an American, Lieut. Lynch, have proved that the level of the Dead Sea is about 1,300 feet below the level of the oceans, and that its depth descends at least as much more. What masks these depressions, moreover, is the water filling them, the surface of which must be considered as forming a part of that of the continents. Besides the three largest of the lakes of Canada, several of the lakes of the Italian Alps, the bed of which sinks below the level of the sea, would appear as similar excavations. We may say the same of the midland seas bordering the European continent on the north and on the south.

2. In all the continents, the line of greatest elevation in the summit of ascent is placed out of the centre, on one of the sides, at an unequal distance from the shores of the seas. From this fact result two slopes, unequal in length and in inclination. This is analogous to what, in mountains, is called the slope and the counter slope.

The length of these two inclined planes, estimated approximately and in round numbers, is nearly as follows for the different transverse sections of the continents represented by the profiles which we have before us. (Figures II. and III.)

the length in geographical
the breadth that of the short one.

	Length in Miles.	
	Northern Europe.	Southern Europe.
	1,500	400
	800	100
	250	60
	300	50
	450	200
	1,200	500

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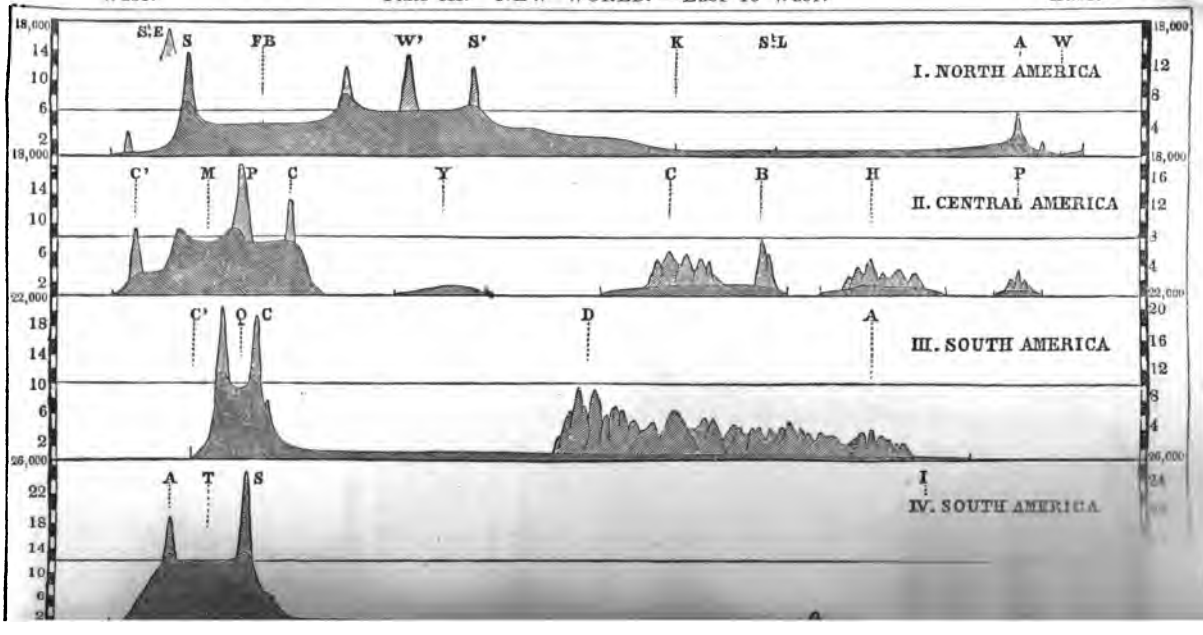
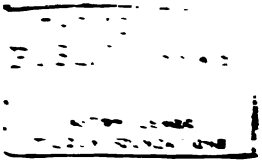
WEST. Plate III. NEW WORLD. — EAST TO WEST. EAST.





NEW WORLD.

	Length in Miles.	
	Eastern Slope.	Western Slope.
1. — North America.		
From Washington to the Bay of St. Francisco; culminating point, the central chain of the Rocky Mountains, ...	1,600	800
2. — Central America.		
From Porto Rico, through Mexico, to the Pacific Ocean — the line slightly broken to take in the Great Antilles; culminating point, the plateau of Mexico, ...	2,000	300
3. — South America.		
From the mouth of the Amazon, through the table land of Peru, to the Pacific Ocean; culminating point, the Chimboraço, . . .	1,850	70
4. — South America.		
From the coasts of Brazil, north to Rio Janeiro, through the Lake of Titicaca, to the Pacific; culminating point, the Nevado de Sorata, ...	1,600	200

We see, by this table, that one of the general slopes of the continents is always, if we take the mean, at least four or five times as large as the other.

3. This law of increase of reliefs is common to the mass elevations, and to the linear elevations; that is, the height of the low lands and of the table lands increases at the same time with the absolute elevation of the mountains. There is a proportional gradation.

This law is exhibited by the following table, containing the principal elements I have used in constructing the profiles. As they are intended to set in a clear

light the most general features of the relief of the continents, these profiles do not always follow an exactly straight line, but they sometimes embrace rather a transverse zone. For the same reason I merely indicate, without taking them into the view, several lofty volcanic peaks, isolated like the Ararat, the Erdshish of Asia Minor, which, considered in relation to the general relief of the countries where they are found, are but accidents, and cause only a local modification. They are marked in the tables by an asterisk.

The first column contains the height of the plateaus, the second that of the loftiest corresponding peaks, both in English feet. In plates II. and III. they are both indicated by their initials.

OLD WORLD. — *North to South.*

	Low l'ds and Table lands.	Highest Mountains.
I. Eastern Asia.		
Coast of the Frozen Ocean, mouth of the Jenisei,	0	0
Plains of Siberia, Barnaul, foot of the Altai Mountains,	380	
Altai, Belucha,	. . . .	11,000
Dsoungary, Lake Saisan,	1,300	
Thian Shan Chain, Bogdo oola,	. . . .	18,000
Eastern Turkestan, Desert of Lop,	2,000?	
Northern Basis of the Kuenlun,	5,000?	
Chain of Kuenlun,	. . . .	21,000?
[illegible]	11,000	
[illegible]	14,000	
[illegible]	. . . .	28,070
[illegible] of the Ganges,	250	
II. Western Asia.		
[illegible] the Caspian Sea,	0	0
[illegible]	500?	

	Low l'ds and Table lands.	Highest Mountains.
2. — Western Asia.		
Atak chain, Kabushan,	. . . .	4,500
Table land of Khorassan,	2,000	
Ispahan,	4,400	
Shiraz,	4,500	
Tengi-Firesen, coast chain,	. . . .	9,000
Coast of the Persian Gulf,	0	0
3. — Western Asia.		
Tiflis, plains of Georgia,	1,160	
Pambak, chain,	. . . .	7,000
Ararat, the plain around,	2,800	
*Ararat, mountain,	. . . .	17,000
Ala Dagh,	. . . .	10,000
Lake Van,	5,400	
Djudid Dagh,	. . . .	12,000
Mossul,	350	
Euphrates, the plains,	200?	
4. — Asia Minor.		
Krimea, Tchatur Dagh,	. . . .	5,000
Black Sea,	0	0
Chains along the coast of Asia Minor,	. . . .	5,000
Table land, Amasia,	1,200	
Kaisarieh, table land,	3,000	
*Erdshish, mountain,	. . . .	13,000
Taurus chain, Bulghar Dagh,	. . . .	10,000
Coast of Cilicia,	0	0
Cyprus, Stavro-Vouno peaks,	. . . .	10,000
5. — Central Europe.		
The coast of the Baltic Sea,	0	0
Plains of North Germany, Berlin,	100	
The Harz, Brocken,	. . . .	3,700
Thuringerwald,	. . . .	3,200
Carpathian Mountains, Tatra,	. . . .	9,500
Table land of Franconia,	800	
Table land of Bavaria, foot of the Alps,	2,100	
The Alps, the Glockner,	. . . .	12,800
Plains of Lombardy,	200	

6.—Africa.	Low l'ds and Table lands.	Highest Mountains
Mediterranean Sea, mouth of the Nile,	0	0
Plains of Cordofan,	1,200	
Table lands of the Zambeze,	5,000	
Lupata Chain,	....	11,000
Nieuweveld Mountains,	....	9,000
Great Karroo,	2,700	
Zwarteberge,	....	5,000
Coast,	0	0

The same law exists in the great peninsulas of Asia whose basis is a table land, and which are almost small continents, as India and Arabia. In those of Europe which are smaller and more irregular, the law is no expressed; yet the Taygetus in Greece, the Sierra Nevada in Spain,—I should add Etna in Sicily, were it not an isolated volcano,—belong to the highest summits of the three peninsulas.

7.—India-Deccan.	Low l'ds and Table lands.	Highest Mountains.
Plains of the Ganges, Delhi,	800	
Aravulli Mountains,	....	5,000
Table land of Deccan, Punah,	1,800	
Syvaree,	2,700	
Nilgherries,	....	8,800
Travancore Mountains,	....	7,500
Palamcotta,	300	
Cape Comorin,	....	500
—Arabia.		
[illegible]	0	0
[illegible], table land,	2,000?	
[illegible]	5,000	
[illegible]	....	6,600
[illegible]	0	0

NEW WORLD. — *East to West.*

1. — North America.	Low l'ds and Table lands.	Highest Mountains.
Washington,	0	0
The Great Valley of Virginia,	300	
Apalachian Mountains,	....	6,000
Mississippi Valley, St. Louis,	500	
Mouth of the Kansas,	800	
Foot of the Rocky Mountains, F. St. Vrain,	5,000	
Spanish Peaks,	....	12,000
Plateau of Inner California,	6,000	
Wind-River Mountains,	....	13,500
Fremont Basin,	4,300	
Sierra Nevada of California, Shastl Peak,	....	14,000
*St. Elias Peak,	....	17,800
Nueva-Helvetia,	40	
Pacific Ocean,	0	0
2. — Central America.		
Porto Rico,	....	3,500?
Haïti,	....	5,000?
Cuba,	....	7,000
Jamaica, Blue Mountains,	....	7,500
Table land of Mexico,	7,500	
Coffre de Perote,	....	13,000
Popocatepetl,	....	19,000
Plateau,	3,000	
Colima Volcano,	....	9,000
Pacific Ocean,	0	0
3. — South America.		
Mouth of the Amazon,	0	0
Sierra Parime, Acarai,	....	4,000
Sierra Parime, Duida,	....	8,400
Foot of the Andes,	1,000?	
Volcano of Cayambe,	....	19,500
Quito,	9,000	
Chimboraço,	....	21,300
Pacific Ocean,	0	0

4.—South America.	Low l'ds and Table lands.	Highest Mountains
Coast of Brazil,	0	0
Table land of Brazil,	2,000	
Itambe, Sierra de Espinhaço,		6,000
Sta Cruz de Rio Grande,	1,000?	
Nevado de Sorata,		25,300
Lake of Titicaca,	12,800	
Volcano of Arequipa,		18,300
Coast of the Pacific,	0	0

The simultaneous increase of the plateaus and of the higher peaks cannot, then, be doubted, and the preceding figures make all comments unnecessary. The inspection of the profiles permits us also to deduce the following general facts:

1. In the Old World, the long slopes are turned towards the north, and the short slopes towards the south. In the New World, the gentle slopes descend towards the east, and the short and rapid slopes towards the west. Thus, in this respect, each of the two worlds has a law peculiar to itself.

2. In each of the two worlds, the two laws exert their influence. In the Old World, though the principal slope is towards the north, we observe still a gradual decrease from west to east; in the same manner, in the New World, though the principal slope is from the west to the east, we observe that the reliefs go on gradually decreasing towards the south, as in the Old World. Besides these principal directions of the reliefs, we observe secondary slopes: in the Old World,

the long slope descends to the west, the short slope to the east; in the New World, the long slope is to the north, the short to the south.

	Low l'ds and Table lands.	Highest Mountains.
1. — Asia - Europe — *from East to West.*		
Dhavalagiri,	. . . .	28,000
Table lands of Tubet,	14,000	
Hindoo-Kuh,	. . . .	20,000
Plateau of Caboul and Kelat,	7,000	
Plateau of Persia,	4,000	
Caucasus, Elbrus,	. . . .	17,800
Asia Minor, plateau,	3,000	
Taurus,	. . . .	10,000
Alps, Mt. Blanc,	. . . .	15,800
Pyrenees, Pic Nethou,	. . . .	11,200
Table land of Spain,	2,300	
Table land of Bavaria,	1,700	
2. — Africa — *from East to West.*		
Abyssinia, Samen Mountains,	. . . .	15,000
Plateau of Gondar,	7,000	
Plateau of Mandara,	4,000?	
Camerun Mountains,	. . . .	12,000
Kong Mountains,	. . . .	3,000
Table land of the Mandingoes,	2,000?	
3. — America — *from North to South.*		
Rocky Mountains,	. . . .	13,500
Plateau of California,	6,000	
Volcanoes of Mexico,	. . . .	17,000
Mexico,	7,500	
Bogota,	8,500	
Quito,	9,500	
[illegible]	. . . .	21,400
[illegible]	12,800	
[illegible]	. . . .	25,300

...ally speaking, the reliefs go on increasing ... the tropical regions. The highest ... are not placed at the equator, but ... of the Tropic of Cancer, in the Old ... north lat.,) and near the Tropic ... New World, (Nevado de Sorata,

... great compensations, one of ... nature. The effect of this law ... the burning heats of these ... such a variety of climate as ... countries of the globe. If ... elevation of the lands ... north, the most civilized ... would be a frozen

... in a single great ... general reliefs of the ... —

... descend towards the ... which is only a ... and rapid slopes, or ... Pacific Ocean ... termination. ... appear ... which ... pre- ... the anti- ... the borders ... by Mr. ... the

great majority of the active volcanoes of our globe, arranged like an immense burning crown. If we add to this feature the multitude of volcanic islands scattered over the ocean, we comprehend the idea, expressed by Steffens, that the vast basin occupies the place of a continent of the early ages, uniting the two worlds, but sunk and submerged at present under the deep waters of the ocean, in consequence of one of the latest great revolutions of our globe.

The Atlantic Ocean, on the contrary, would be a simple depression, somewhat in the form of a trough, owing, perhaps, to a lateral pressure, and partly to the tilting motion which lifted up the lands in the neighborhood of the Pacific. Hence, its narrower breadth, the valley form, the absence of numerous islands in the interior of its basin, and the descent of all the neighboring continents by gentle slopes. Nevertheless, if we suppose the lateral force that pressed it in to have been very strong, we may conceive that this valley has a great depth.

Thus, then, gentlemen, a great law, a general law, unites all the various systems of mountains and of plateaus that cover the surface of our globe, and arranges them in a vast and regular system of slopes and counter-slopes. Considered with reference to the present state of geology, this result is astonishing. The study of the relative ages of the different systems of elevations, teaches us that each of them has existed a long time separately. One appeared in one country at a given epoch, another in another. The continents are only formed, so to speak, by piecemeal, in the train of the geological epochs; and, nevertheless, the definitive

result makes a whole, composed of parts subordinated to each other in a certain system, which might be called an organism in this order of things.

This is not the moment to press the consequences of so remarkable a fact. It is enough for me to have pointed it out to your attention.

I will add only, that the geological researches place beyond a doubt the existence of an intimate relation between the height of the mountains and of the plateaus, and the epoch of their appearance above the surface of the ocean. The most ancient chains of mountains are the least elevated: while the colossal grandeurs of the Andes and the Himalaya bear the traces of an upheaval comparatively very recent. In America, from the coasts of Brazil to the high table lands of Bolivia, and from the Atlantic shores to the Rocky Mountains; in Europe, from the mountains of Scandinavia to the summit of the Alps, we meet with upheavings successively less ancient. In the two worlds the continental masses have then become greater in the lapse of the ages not by chance, but in two determinate directions: that is, in a geographical order, from the north to the south of the Old World, and from the east to the west in the New; and I think we may hence infer that from the moment when [illegible] lands we know emerged, the continents have [illegible] themselves on the spot where

[illegible] here to observe that it is [illegible] order [illegible] and according to a plan which we shall [illegible] when examined and meditated, when [illegible] of the consequences of this [illegible]

LECTURE III.

Distribution of the table lands, the mountains, and the plains in the different continents; the Old World that of plateaus, the New World that of plains — The basin of the oceans; this inquiry completes the study of the plastic forms of the earth's crust — Division and characteristics of the oceans; their contours and their depth — Comparison of the latter with the mean elevation of the continents — Conclusions — Necessity of considering the physiology of the continental forms — Point of view which should be taken — Law of the development of life.

LADIES AND GENTLEMEN: —

In our last lecture we carried our examination into the general forms of relief of the continents. Our investigation has permitted us to establish the existence of a great common law of slopes and counter-slopes, of increase and decrease of reliefs. The entire continents, as well as the mountains, have two principal unequal slopes; the long and gentle slopes descend towards the Atlantic and Frozen Ocean, the short and steep slopes towards the Pacific Ocean.

To finish this subject, it remains to say a word upon the distribution of the table lands, of the mountains, and of the plains in the different continents.

The distribution of these three great forms of relief — is it uniform or not? Or are there not some characteristic differences, to be pointed out in this regard, between the continents? Does not the form of the elevated table lands prevail in one part of the world, the form of the

plains in another, the form of the mountains, finally, in yet a third? If we call to mind the important influence each of these forms exerts on the climate, the productions, and on the conditions of existence, and growth of the nations, we shall regard this question as one of those which most concern our subject.

Considered in this point of view, the continents present, in reality, remarkable differences.

The Old World, as we have learned from the study of its reliefs, is that of table lands and mountains. No continent exhibits plateaus so elevated, so numerous, so extensive, as Asia and Africa. Instead of one or two chains of mountains, like the Andes, Central Asia is traversed by four immense chains, supporting vast table lands of from 5,000 to 14,000 feet in elevation, and the loftiest mountains of the globe.

The extent of this elevated region is more than 2,400 miles long, by 1,500 miles broad. The principal mass of Western Asia is nothing but a plateau, from three to six thousand feet in height. Africa, south of Sahara, seems to be only an enormous pile of uplifted lands. It has been calculated that the mountains and plateaus of Asia cover five sevenths of its surface, while the plains occupy only two sevenths. In Africa, the high regions form two thirds of the continent, the plains only one third.

If I call the Old World the world of plateaus, it is not because great plains are wanting there. The whole north of Europe and of Asia is merely a boundless plain, and from the shores of Holland, through Germany, Russia, the ...he Caspian and Siberia, the traveller m... ...ient World from the Atlan-

tic to the Pacific Ocean, for a distance of more than six thousand miles, without encountering an eminence of more than a few hundred feet in height. In Africa, also, the plains of Sahara extend 2,500 miles in length, by 1,000 in breadth. But the situation of these plains of the Old World under the frozen sky of the north, and under the fires of the tropics, together with the nature of their soil, takes from them all their importance. The one is a frozen waste, a Siberia; the other a burning desert; and neither the one nor the other is called to play an essential part, nor do they impress upon their respective continents their essential character.

The New World, on the other hand, is the world of plains. They form two thirds of its surface; the plateaus and the mountains, only one third. The high lands form only a narrow band, crowded upon the western coast of the two continents. Almost the whole East runs into immense plains, covering it, one might say, from pole to pole. From the Frozen Ocean to the Gulf of Mexico, over an extent of nearly 2,400 miles, we cross only insignificant heights. From the llanos of the Orinoco to the banks of La Plata, we traverse more than three thousand miles of low plains, slightly interrupted by the somewhat more elevated regions of western Brazil; they are prolonged even to the Pampas of Patagonia, 600 miles further south, to the southern extremity of America. The length of the rich plains watered by the Marañon, in the direction of the current, is nearly 1,600 miles; and what are the plains of the Amazon and the Mississippi, compared with those of Siberia and Sahara? A happy climate, a rich and fertile soil, a

tation, prodigious resources— they have
the prosperity of a country; who does
re is the character of America, here lies
the New World, while the countries of
d plateaus seem destined to play only a
rt!

his regard the two worlds have each its own
and form a great contrast; so that we may
n one of the hemispheres, the plateaus and
ains predominate. while, in the other, the
e the important and essential feature of relief.
, if we were seeking for a continent where the
ountains without plateaus at their base, should
aracteristic feature. it would be necessary to
ntinent comprehending in it only Western Europe
Russia; that is historical Europe, the true
ther all. This continent with Russia, has
ains of Plains to one fourth of mountainous
Asia, leaving out Russia it is quite otherwise.
Asia from one end to the other. whether over
ns of its peninsulas you will find every-
ding out in all directions by chains
ing each other. In all this part
the highest existing plain, that of
Poland is only six hundred
the north. It is the extremity
Hungary, of Lombardy,
not deprive this part of the
its character essentially be-

We have now considered the configuration of the general forms of the continents; let us not forget that this is only one half of the plastic forms of the earth's crust. There is another, which, though hidden from our sight, is none the less entitled to our interest. It is the basin of the oceans.

The positive forms of the lands which we have studied determine negatively for the oceans, whether horizontally or vertically, certain forms no less characteristic. We ought, then, to examine the character of the ocean basins, in the two-fold relation of the forms and the indentations of their shores, and of their depth. But the time presses, and I must be brief; limiting myself to the essential facts, I shall omit all that does not touch directly upon my subject.

The continents determine the general outlines of the great ocean basins. The indentations of their coasts give the articulation of the shores of the oceans; the islands, by their disposition, by their less or greater frequency, furnish what else is wanting to complete their character; the one is the counterpart of the other; they are the same forms, but in an inverse order.

Two great oceans, the Pacific and the Atlantic, corresponding to the two worlds, surround, on almost all sides, the principal terrestrial masses. We may detach
Pacific, the Indian Ocean, which, though
it, has some special characteristics; and
the Atlantic, the Northern Frozen Ocean,
which gives it a particular physiognomy.
eat Southern Sea, we may consider it less
itself than as a common reservoir, whence

issue, so to speak, all the seas of the globe, to make their way into the lands.

The Pacific, the Indian Ocean, the Atlantic, correspond to the three double worlds which we have distinguished, following Steffens, and separate them from one another. Each of them, also, is divided into a northern and a southern basin, except the Indian Ocean, which, on this account, is only a half ocean.

The general forms of the contours of these three oceans have, as a common feature, a wide opening towards the south, and are narrowed to a point on the north, just the reverse of the continents. Each of these has, meantime, a form peculiar to itself. The Pacific Ocean is an oval, wide open on the south, the sides coming nearer and nearer together towards the north, so as to leave, between America and Asia, only the narrow passage of Behrings' Straits, by which it communicates with the Frozen Ocean.

The Indian Ocean has the form of a triangle, with the vertex turned to the north; the Atlantic that of a valley with nearly parallel sides, which, narrowed for a moment, then broadens into the Frozen Ocean.

The oceans differ, moreover, in the mode of articulation of their shores. These indentations have very various forms, which I will classify, for the moment, under three species: the *gulfs*, like that of Bengal; the *inland seas*, isolated from the rest of the ocean by [illegible] and chains of islands, like the Sea of Japan, [illegible] of Okhotsk; the *inland seas*, surrounded on all [illegible] continuous manner, like the Med-

Considered with reference to the indentations, the three oceans have their own respective characters, and we find that in each, one of these three forms predominates.

The Pacific Ocean is that of the land-locked or closed seas; for there are no less than five of considerable size along the coast of Asia: the Sea of Behring, closed in by the peninsula of Aljaska, and the chain of the Aleutian Islands; the Sea of Okhotsk, enclosed by the peninsula of Kamtschatka, and the series of the Kurile Islands; the Sea of Japan, shut in by the island chain of this name; the northern Chinese Sea, locked by the islands of Lieu-Khieu and Formosa; the Southern Sea of China, locked by the Philippines, Borneo, and the peninsula of Indo-China. We may almost call the Vermilion Sea, or Gulf of California, an inland sea, it being the only indentation of this ocean somewhat marked, on the American coast.

The Indian Ocean is that of gulfs; for the two great Gulfs of Bengal and the Persian Sea impress upon it its character. It pushes, besides, into the interior two mid-land seas, the Persian Gulf and the Red Sea, which detach the peninsula of Arabia from the rest of the continent.

The Atlantic Ocean is that of inland seas. No one advances further into the lands, piercing into the very heart of the Old World and the New. There are, at least, four mediterraneans, without taking into the account the Polar seas; two on the European side, the Mediterranean, properly so called, divided into three great basins; the Eastern, the Western, the Black Sea, not to mention several others of small size, and the

[illegible] in the centre of the New World, the Gulf of Mexico and Hudson's Bay. Neither is the form of land-locked seas wanting here also: the Northern Ocean, in the centre of the Old World, the Caribbean Sea in Central America, closed by the peninsula of Yucatan and the chain of the greater and lesser Antilles; the Gulf of St. Lawrence, closed by the peninsula of Nova Scotia and Newfoundland, are the proofs. The great gulfs are represented by those of Guinea and of Biscay. The Atlantic Ocean is then, the most articulated, the most indented of the oceans, and that which, by its bending with the lands, approaches the nearest to the character of the inland seas. It is, if I may venture to say so, the most *maritime* of the oceans, as the Pacific is the most truly *oceanic*.

The islands finally are one of the most interesting characteristics of the oceans. There are two species to be distinguished: the *continental* islands, which their proximity, their size, their geognostical character, their forming a line with the mountain chains of the firm land, prove to be a dependence of the continents; and the *oceanic* or *ocean* islands, dispersed singly, or in [illegible] from the lands over the vast surface of small dimensions and always of [illegible] character.

[illegible] is of the richest in islands, whether [illegible] Indian archipelago and [illegible] largest continental archipelago of the globe; and the [illegible] with which the centre of [illegible] elsewhere also their parallel.

The Atlantic Ocean possesses still, in the group of the Antilles, the British Isles, and those of the Mediterranean, continental archipelagos of great importance; but the pelagic islands are poorly represented there by the groups of the Azores, Madeira, the Canaries, Cape Verd, St. Helena, and some other small islands lost in the midst of the ocean.

The Indian Ocean is scanty in both. Madagascar and Ceylon, one by a main-land, represent the continental islands. Here and there a few volcanic islands, as Mauritius and Bourbon, represent the pelagic.

Each ocean, therefore, differs from the others, in some peculiarities of character; and we readily conceive how these circumstances may modify their importance, with regard to the facility or the difficulty they may bring into the relations of exchange which commerce establishes among all the nations of the world.

Let us now see what is known of the vertical dimensions, or of the configuration of their basin.

The basin of the oceans is depressed below the face of their waters, as the continents are elevated in the atmosphere above the same surface level. It may, then, be said, that we know not one half of the reliefs of the solid crust of our globe, for more than two thirds are concealed from our observation by the seas that cover them. It would, nevertheless, be of the highest interest for geology, as well as for the physics of the globe, to ascertain the forms, the depth, and the nature of the bottom of the oceans. But though we have numerous soundings, executed in the neighborhood of the shores, to

[illegible] the wants of navigation, we have only a very few [illegible] in the deepest parts of the oceans. These operations require a consumption of time, and an [illegible] which will always render them rare. [illegible] has been [illegible] hypotheses, while waiting for [illegible] on the subject.

[illegible] the [illegible] of the continents, the seas are [illegible] and their bottom seems to be only the [illegible]. It [illegible] slopes of the relief of the continents that [illegible] them. Thus the Baltic Sea has [illegible] between the coasts of Germany [illegible] Sweden scarcely a twentieth part of that [illegible] in the Italian Alps; further north, it [illegible]. The Adriatic between Venice and [illegible] has a depth of only 13 feet. In these two [illegible] we see that the bed is only the continuation of [illegible] of Northern Germany [illegible] is the same with the Northern Sea, [illegible] which unite the British Islands. Here is [illegible], which serves as a common [illegible] of the coasts of France and the British Islands; [illegible] never more than 90 feet, and frequently [illegible] between France and England, [illegible] exceed 30 feet; but at the [illegible] of Ireland, for example, [illegible] more than 2,000 feet; we [illegible] of the Atlantic really

[illegible]ope are distinguished [illegible] greater depths. The [illegible]e called a basin broken

through, and fallen in, resembling on a small scale what the Pacific Ocean is on a large one. All the short and abrupt slopes of the lands surrounding it fall rapidly towards the interior. The western basin, in particular, seems to be very deep; it is isolated from the Atlantic, by a submarine ridge or neck, which, in the narrowest part of the Strait of Gibraltar, is not more than 1,000 feet below the surface. But a little further towards the east, the depth falls suddenly to 3,000 feet; and at the south of the coast of Spain, and of the Sierra Nevada, a depth of nearly 6,000 has been ascertained by Captain Smith. Captain Berard indicates still greater depths on the coast of Algeria. If we may believe Marsigli, and if he has not made some mistake in the statement, there has been found in the prolongation of the Pyrenees, the enormous depth of 9,000 feet. Not far from Cape Asinara, on the north-west of Sardinia, the plummet has been sunk, without touching bottom, at a depth of nearly 5,000 feet.

Between Sicily and the coast of Africa, at Cape Bon, a second neck, from 50 to 500 feet in depth, separates the western from the eastern basin of the Mediterranean.

seems to be less deep than the former; never-
epths of from 2,000 to 3,000 feet have been
d in the neighborhood of the Ionian Islands,
outhern coast of Asia Minor.

to partake of the character of
ssian maps give it more than
Crimea, and 2,500 on the coast
spian Sea, placed on the limits
and of the table land of Persia,

[illegible] part, as far [illegible] is the continuation of [illegible] This limit [illegible] the basis of [illegible]

[illegible] the depth increases with [illegible]

[illegible] the islands forming [illegible] locked [illegible] indicate the [illegible] [illegible] these [illegible] The seas [illegible] Islands, and [illegible] reach the depth [illegible] scarcely four or [illegible] more than 100 [illegible] The depths of the ocean begin [illegible]

[illegible] it has often been said that the sea is [illegible] shores, and [illegible] The facts just [illegible] correct in many [illegible] and does not hold [illegible] seas of Eastern Asia [illegible] by very high lands. The [illegible] Asia ends with abrupt [illegible] to go out more than 100 [illegible] of water. According to [illegible] find so greater depth of [illegible] of the lofty Andes, the [illegible] down so suddenly into the

Pacific Ocean; and nevertheless, under the parallel of Lima, this ocean has only 600 feet, more than forty miles from the coast. On the other hand, the low plains of the Landes of Bordeaux, on the coast of France, lying along the Gulf of Biscay, look out upon a sea, the bottom of which, at a short distance, sinks already lower than a thousand feet.

In Central America, the Gulf of Mexico, 300 miles from the coast of the United States, and 100 miles north of Yucatan, has a depth of only 600 feet; it is, perhaps, a submarine continuation of the plains of Mississippi. Beyond the line of the Antilles, on the contrary, in the volcanic basin of the Caribbean Sea, Captain Sabine indicates a temperature taken at 6,000 feet below the surface.

With regard to the depths of the open sea, they are still but little known; we have, however, some very interesting measurements in the Atlantic Ocean. I cite the most remarkable:

Captains Scoresby and Parry found the basin of the Polar seas very deep, but unequal. Scoresby did not touch bottom, at the 76th degree of north latitude, with a sounding line of 7,200 feet in length. Captain J. Ross went beyond 6,000, in Baffin's Bay. Science is indebted to the skilful direction of the United States Coast Survey, for a great number of very instructive soundings on the [illegible]dle of the middle part of the Atlantic. One [illegible] of those engaged in this service, Captain [illegible]vis, U. S. N., whose labors have contrib[illegible] a better knowledge of the true conforma[illegible]arine portion of the United States coasts [illegible]d 7,800 feet, about 250 miles south of

Lieutenant G. Bache, 13,000 feet, 34° N. L.
Professor A. D. Bache, Superintendent of
the operations of 1848, a
taken by the late Lieutenant
giving a depth of 3,300
without reaching the bottom.
hitherto ascertained
surpassed by a
Walsh, U. S. N., under
F. Maury,* director of the
On the 15th of November,
north latitude, and
from Greenwich, in the
assigned to the
the weather being calm
U. S. N., sunk the lead
feet without
the line alone pre-
depth still, for all
favorable. This
the deepest of
J. C. Ross,
beneath
which we
southern basin of the
immense depths,
the belief

* To this last I am
for the
to
universally

in the existence of high bottoms, separating this basin from that of the north. Captain J. C. Ross found 16,000 feet in depth, west of Cape of Good Hope, and 27,600, without touching bottom, west of St. Helena. The first of these measurements equals the height of Mt. Blanc, and the second almost reaches that of the Dhavala-Giri; but it would be necessary to add Mt. Washington, with its 6,000 feet, to the height of this giant of terrestrial summits, to attain a height equal to the sounding of Lieut. Walsh. Thus the greatest known sea depth, added to the elevation of the highest mountain of the globe, gives us over 62,000 feet for the thickness of the layer of our globe, upon which our investigations have supplied some information.

Dr. Young, relying upon deductions drawn chiefly from the theory of the tides, thought himself justified in assigning about 15,000 feet to the Atlantic, and about 20,000 feet to the Pacific. D'Aubuisson believes them not to exceed from 9,000 to 12,000 feet. Now we see that the actual measurements leave these estimates far behind.

Laplace, guided by theoretical considerations with
t general form of the globe, admitted that
(h of the seas is a quantity of the same
' .e mean elevation of the continents; which,
' ..t surpass a thousand metres, or 3,000
' researches of Humboldt have
ɔ of the mean relief of the con-
He has sought to determine its
nd, as the most probable result,
for the different continents:

	Mean elevation.
Europe, ...	671 feet.
Asia, ...	1,151 "
North America, ...	748 "
South America, ...	1,132 "

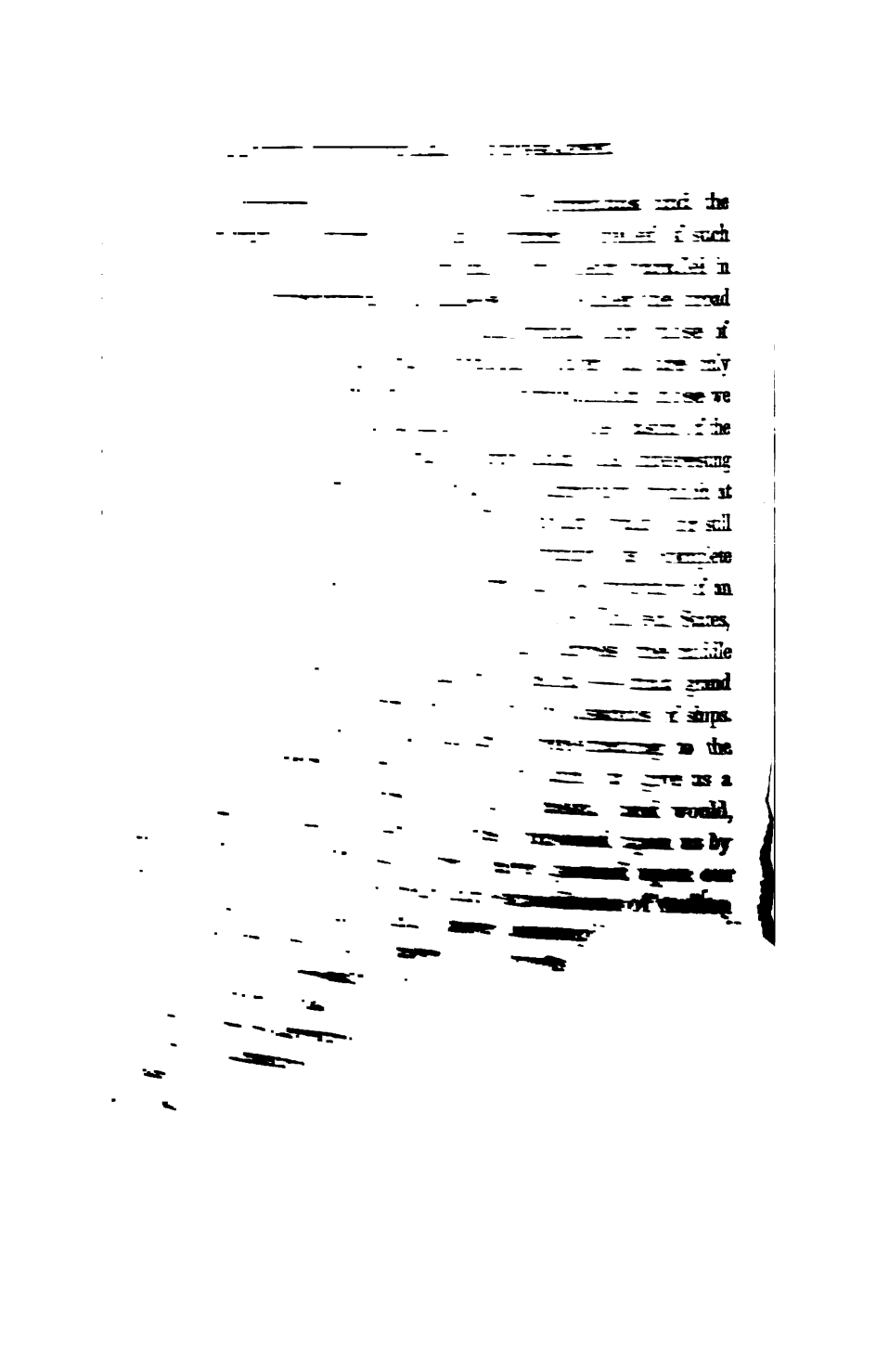
He consequently places the mean elevation of the continental lands at 1,008 feet above the level of the ocean.

Now this number is evidently too low to express the mean depth of the oceans.

It has seemed to me that it would not be uninteresting to compare the depths observed in the Southern Atlantic, with what would be found by supposing that the general planes of inclination of the opposite continents of Africa and America were prolonged until they met under the surface of the ocean. Professor B. Peirce has had the kindness to make the calculation, which gives the following result. Taking as points of departure for Africa, the table lands of Southern Africa, at the foot of the Lupata, and estimating their height at 5,000 feet; and for America, the table lands of Bolivia, estimated at 12,000; the planes which pass through the respective coasts of these continents intersect each other at a distance of nearly a thousand miles from the coast of America; that is, a third of the way across the Atlantic, and 7,600 feet below the surface of the oceans. If the points of departure were taken at the summit of the Lupata, at 1.,000 feet, and of the Andes, at 24,000, the depth would be about 15,000 feet, which perhaps is not far from the mean depth of this part of the great oceanic valley. But we see that other causes depress the level, in some parts, to depths twice as great. The basins are not, therefore, *mere continuations* of the general relief of the continents,

and this is otherwise shown by their conformation. On leaving the greater part of the shores, the submarine ground descends slowly, in a proportion sufficiently analogous to the general slopes presented by the ground above water on the continents. But, at a point more or less distant from the shore, the slopes abruptly change, the depths suddenly increase, and often become ten times as great at a short distance. I will cite, as examples, the very exact lines of soundings traced perpendicularly to the coast, at several points, between New Jersey and Block Island, at the eastern extremity of Long Island, under the direction of Professor A. D. Bache, for which I am indebted to his kindness. In all the sections, we see the ground descend slowly, gradually, and without great variations, to the distance of 80 or 100 miles from the shore, where the depth scarcely reaches from four to five hundred feet. Beyond this distance, the depth invariably increases so rapidly, that it is sufficient to proceed [illegible] miles further to find three or four thousand feet. [illegible] first part is about five feet a mile; the second, [illegible] than four hundred.

[illegible] is the same with nearly all the grand banks, or high [illegible]. That of Newfoundland, that of [illegible] southern point of Africa, all termi- [illegible] pths of the ocean, in abrupt descents, [illegible] a gr[illegible] [illegible]eir extent. The bottom of the [illegible] near t[illegible] great banks, present themselves as h[illegible] ured with the bottom of the [illegible] eans. [illegible]el, amounting to 10,000 [illegible]eet over [illegible] ten miles; of 20,000 feet, [illegible] betw[illegible] [illegible]atteras and the shore; of



tinuation of the relief of the continents. But at a certain distance from the shores, the sounding gives suddenly great depths, and this abrupt transition seems to indicate the submarine border of the proper basin of the oceans.

Certain interior seas, like the Mediterranean and Caribbean, are deeper than would be expected from their proximity to the lands, and seem to be sunken basins, the form of which is connected with the volcanic phenomena often displayed over their whole extent, but chiefly on their margins; that is, on the principal line of fractures.

The interior of the basin of the oceans is unequal, generally deeper than towards the borders. The greatest observed depths are found in the middle region of the Atlantic. They equal, or surpass, by several thousand feet, the elevation of the highest mountains of the globe, and are found, like them, in the neighborhood of both tropics.

The mean depth of the basin of the ocean seems to be much more considerable than the mean elevation of the continents above their surface, and appears to increase with the relief of the neighboring continents.

We have thus [illegible] our survey of the great forms of the terrestrial [illegible] We have examined them as the anatomist [illegible] ine the body of an animal. [illegible] take. essary condition [illegible] nowle not be sufficient. [illegible] se grea in operation; we [illegible] life, [illegible] acting upon each [illegible] *of the conti-*

But we will not plunge into the infinite details that might be embraced in our subject. We shall continue to study the great features, the prominent traits, which will offer themselves to our notice.

After having recognized great terrestrial individuals, presenting, by their forms and their disposition, an assemblage of characters peculiar to them alone, we have to inquire if, in virtue of these forms themselves, and of this particular position, each of these individuals has not a peculiar physical life, manifesting itself, in the main, by a climate, a vegetation, an animal world, and, relatively to human societies, by special functions which belong to no other. We shall endeavor to discover if there is not here, also, a general law, which gives us the key to all these partial phenomena, helping to group them, and to grasp, in the true point of view, the collective manifestations of the life of our planet, whether in nature, or in the history of man.

But to this end, gentlemen, in order to place you in the point of view from which I would have you consider with me the phenomena of the life of the globe, I cannot avoid the necessity of carrying you for a moment into a world somewhat different from the world of forms wherein we have thus far moved, and to appeal to the eyes of your *mind*, rather than to those which have, up to the present moment, been fixed upon these maps.

In fact, nothing less is necessary than to say to you, in as few words as possible, — to prove to you, if it can be done, — that there is a law of life and of growth, which, if taken in its most general formula, in its *rhythm*, is

applicable to all that undergoes the process of development.

All life, as we have said, gentlemen, in its most simple formula, may be defined as a *mutual exchange of relations*.

An exchange supposes at least two elements, two bodies, two individuals, a *duality* and a difference, an inequality between them, in virtue of which the exchange is established.

There is, then, at the foundation of all the phenomena of life, a difference between two or more individuals, calling out an action and reaction of one upon the other, the incessant alternation of which constitutes the movement we call life, and which gives birth to all the phenomena we consider as its manifestation.

Let us endeavor, first, to detect this law in inorganic nature.

This lamp that gives us light, the gas that burns before our eyes, what else is it than one of those phe- of inorganic life, the result of the mutual repeated action of two heterogeneous bodies upon oth ga We have, on the one side, the hydro- esen ipe, and brought into the n the air. These are two but having different prop- them under suitable conditions re, an action immediately s; they ctivity which be- sible to t by l development of light; col , vital movement

their differences are extinguished, or rather combine and harmonize in a new body, a product, the end of all this activity, in which the antagonism of the primitive elements has ceased. This new body is water; it is a liquid and no longer a gas: it is a body, all the physical properties of which are different from those that compose it which, as you know, play very different parts throughout nature. This same gas that serves to light us contains also carbon: this also combines with oxygen to form a new body of carbonic acid gas, the properties of which are all special in it.

Each of these new products may, in turn, enter into relations of exchange with others, and pass as an elementary body into a new combination, the result of which will be a body composed of four simple elements, but endowed, as such, with entirely different qualities, belonging to it alone. It may, in turn, become one of the elements composing a multitude of bodies; and it is thus that the sixty elements our chemical means have not enabled us to decompose, which chemists call simple bodies, supply nature with materials sufficient for the immense [illegible] of all the compound bodies that exist.

We [illegible]y, in all this physical and [illegible] difference between two [illegible]one upon the other, [illegible], which may, in its [illegible]rk, gentlemen, these [illegible]on, at the present

[illegible]n, a difference between

two bodies excites none the less a vital movement. Place near each other a plate of zinc and a plate of copper; these two enter immediately into an interchange of positive and negative electricity, and give birth to those powerful electrical and magnetic currents which modern industry puts to such admirable use. I say, further, place side by side two plates of the same metal, but unequally heated, and there is established between them an interchange of temperature, and of electrical currents of the same nature. Thus everywhere a simple difference, be it of matter, be it of condition, be it of position, excites a manifestation of vital forces, a mutual exchange between the bodies, each giving to the other what the other does not possess. To multiply these differences, to increase their variety, is to render the actions and reactions more frequent, is to extend and to intensify life.

But let us pass to organized nature. It would be easy to demonstrate, gentlemen, that the law we have just recognized is also that which governs the growth of the vegetable; but I would rather trace it in
l world, wherein it is expressed still more

see, first, how nature proceeds in the forma-
lual, the animal. No one has
earned friend,* whom I need
Thanks to him, these facts
ou; I shall need only to recall

with
.mal considered in itself as an

ssor Agassiz.

individual. In a liquid animal matter, without precise form, homogeneous, at least in appearance, a mass is outlined which takes determinate contours, and is distinguished from the rest: it is the egg. Soon, in the interior of the egg, the elements separate, diverging tendencies are established: the matter accumulates and concentrates itself upon certain points: these accumulations assume more distinct forms and more specific characters: we see organs traced, a head, an eye, a heart, an alimentary canal. But this diversification does not go on indefinitely. Under the influence of a special force, all these diverse tendencies are drawn together towards a single end; these distinct organs are united and coördinated in one whole, and perform their functions in the interest and for the service of the individual commanding them.

What, then, has been the course pursued here by nature!

The point of departure is a unit, but a *homogeneous unit*, without internal differences: a chaotic unit, if I [illegible] so: for what is a chaos but this [illegible] in a mass all the parts of which

[illegible] the establishment of *dif-*
[illegible] functions their special

[illegible] *organic or harmonic*
[illegible] lividual organs are not
[illegible] each of them *their*
[illegible] out.
[illegible] is what is ordinarily

The progress, we say, is *diversification;* it is the variety of organs and of functions. What, then, is the condition of a greater amount of life, of a richer life, of a completer growth for the animal? Is it not the multiplicity and the variety of the special organs, which are so many different means whereby the individual may place himself in relation with the external world, may receive the most varied impressions from it, and, so to speak, may *taste* it in all its forms, and may act upon it in turn? What an immense distance between the life of the polype, which is only a digestive tube, and that of the superior animals; above all, of man, endowed with so many exquisite senses, for whom the world of nature, as well as the world of ideas, is open on all sides, awakening and drawing forth, in a thousand various ways, all the living forces wherewith God has endowed him!

And what we here say of organic individuals — is it not true of societies of individuals, and particularly of human societies? Is it not evident that the same law of development is applicable to them? Here, again, nogeneousness, uniformity, is the elementary state, savage state. Diversity, variety of elements, which for ltiply exchanges; the almost infinite the functions corresponding to the stowed on every man by Providence, nto action and brought to light by s of a society as complicated as ours, all times, been the sign of a social igh degree of improvement.

l, conceive the possibility of this mul-

industrial talents that have their birth in the luxury, and are revealed by the thousand ele- hings displayed in our drawing-rooms, among ns of the Rocky Mountains, sheltered by the ches which form their wretched huts? The al life, which creates the prosperity of the nations of the globe, — is it possible among a se ambition is limited to hunting in the neigh- l the animal that is to furnish food for the uld we hope to see the wonders of architecture mong a people who have no public edifices rhanging foliage of their forests? Had Ra- born among them, would he ever have given ble masterpieces to the world? And the asures of intelligence and of lofty thoughts our libraries, — where would they be, if ties had preserved the simplicity a false as called the simplicity of nature, but in ost opposed to the true nature of man?

nen, it is the exchange of products by the world, that makes the material life the nations. It is the exchange of pen and by speech, that sets in mo- nce. It is the interchange ns, that makes the moral of man.

mutual, is exchange. In ieties, that which excites lition of life, is *difference*. is diversity; the end is all differences, all indi-

vidualities to exist, but coördinating and subjecting them to a superior aim.

Every being, every individual, necessarily forms a part of a greater organism than itself, out of which we cannot conceive its existence, and in which it has a special part to act. By performing these functions, it rises to the highest degree of perfection its own nature is capable of attaining. Unhappy he who isolates himself, and refuses to enter into those relations of intercourse with others which assure to him a superior life. He deprives himself voluntarily of the nutritive sap intended to give him vigor, and, like a branch torn from the vine, dries up and perishes in his egoism.

All is order, all is harmony in the universe, because the whole universe is a thought of God; and it appears as a combination of organisms, each of which is only an integral part of one still more sublime. God alone contains them all, without making a part of any.

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LECTURE IV.

Recapitulation—The law of development applicable to the whole globe, considered as an individual—Origin of the Earth according to the hypotheses of Laplace and Fourier—Gradual formation of the continents—Europe at the Silurian epoch—North America at the Carboniferous epoch—Character of inferiority of the organized beings which corresponded to these ancient formations—Europe at the Tertiary epoch—Greater diversity and perfection of the organized beings—Distinction of the three epochs: the continental, the maritime, and the intermediate—The formula of development the same for the entire globe and for the organized beings—Consequences—The law of progress and the law of contrasts—The three grand terrestrial embranchements.

LADIES AND GENTLEMEN:—

We have recognized, in the life of all that develops itself, three successive states, three grand phases, three evolutions

lly repeated in every order of existre all is confounded together; a all is separating: a *unity*, where and organizing. We have of *phenomenal life*, the ier in inorganic nature *or*

ion of development; the the consequence of these t life.

of organs, the more

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active and the superior in its nature is the life of the individual.

The greater the variety of individualities and relations in a society of individuals, the greater also is the sum of life, the more universal is the development, the more complete, and of a more elevated order.

But it is necessary, not only that life should unfold itself in all its richness by diversity, but that it exhibit itself in its utility, in its beauty, in its goodness, by harmony.

Thus we recognize the proof of the old proverb, "variety in unity is perfection."

If such is the law of life in all beings, it ought equally to be the law of life of our entire globe, collectively considered, as a single individual. It is the investigation of this question I am going to attempt this evening.

The investigation, in order to be complete, would presuppose a perfect knowledge of the origin of our globe. But who is ignorant that in this respect we are yet in the world of suppositions? Nevertheless, the brilliant ypotheses of Laplace and Herschell on the primi- ve formation of our planet, and the results, better unded, pe eology gives us, upon the history the su anges the surface has undergone, rmit us, ot deceive myself, to detect with rtainty phases of development we wish aware of the objections that may one and the other; but it seems more upon the details, than upon s, and that in astronomy, as in

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[illegible] [illegible] [illegible] [

nebula is detached from the general mass under the form of a luminous spheroid, traced in the obscurity of the heavens. This is the first step in the process of formation.

This gaseous spheroid then resolves itself into local agglomerations, which, while concentrating each in itself, under the influence of gravitation and chemical combinations, separate from each other in distinct spheres. Whether this phenomenon is effected, as Laplace imagines, by the successive separation and agglomeration of concentric layers of the solar atmosphere, or in virtue of some organic law, still unknown, is of little importance here. The fact of the separation of the different bodies of our solar system into a number of spheres, planets, and satellites, is not less certain, and constitutes one of the essential and incontestable phases of its development.

Let us leave the other stars, elder and younger brothers of the earth, and follow henceforth the ulterior changes our own globe undergoes.

The gradual concentration, and perhaps certain ...s of temperature, permit successively the com- ... of a *multitude* of different bodies; and the ...s far as regards the general forms, of all this ...hemi... ...sical life, is to present matter, under... ...orm, gas, but under the three gaseo... ...nd solid matter. These three ...ra... ...es in the order of their den- gle... ...sed of a solid mass at the ...el... ...a liquid, and secondly by a

...eous covering—the ocean, and the primeval atmos-
...phere.

At the surface, meantime—and it is the history of this surface which it concerns us most to know for our study—two elements only are in contact, the air and water. The winds and the marine currents, owing to the unequal distribution of the solar heat, doubtless exist; but the differences of temperature being very considerable between one place and another, they must be internal, and, besides, they are perfectly regular and uniform for no land disturbs the equilibrium of the envelope of the atmosphere due to this general ... a ... of the atmosphere probably ... a higher degree of heat in the ... the course of the currents, ... temperature is more uniform from one ... the other. The rains, if the state of ... permits their existence, are useless, for ... receive them, and to render them ... In this state of things, organic life ... Plants and animals live in the ... earliest fossiliferous strata, ... contain none of ... varied, and all be- ... scale of organized ... incy of the vege-

... marks a new ... ents, or rather, ... globe, the third

element, the *solid*, the earth, quitting the place its weight had assigned to it, rises from the bed of this boundless ocean; it lifts itself above the level of the waters, cuts the surface, puts itself in contact with the atmosphere, from which it had been separated by the whole thickness of the primeval ocean, and warms itself in the life-giving rays of the sun.

This fact of the appearance of the firm earth above the waters of the oceans, is an immense step in the rise and growth of the life of the globe. The three forms of matter react henceforth upon each other; the atmosphere, the seas, and the lands, absorbing the solar heat in an unequal manner, the ancient equilibrium is destroyed; the winds, the currents, are modified in their march; the climates are more varied; the rains become [illegible] and henceforth water and fertilize the land. [illegible] a new element renders the appearance of a [illegible] superior organic life possible, and becomes the [illegible] vegetation, and an animal world of a very [illegible] degree of perfection from that which existed [illegible] it is a victory gained by higher life over matter, which it cc[illegible] serve a more exalted end.

[illegible]rates that in the earliest ages of [illegible] on the earth, the organic epoch, [illegible]it, the firm lands are reduced to [illegible]d over the bosom of the

[illegible] gurgite vasto."

[illegible] are modest. The place [illegible]ot yet marked, except by

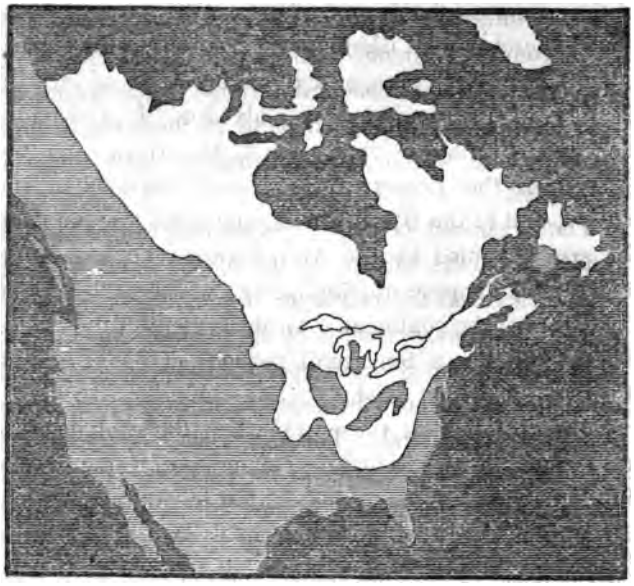
stantially those of the present dry lands which already existed at that time, and which have not been covered by the waters of the ocean since those ancient epochs, except, perhaps, in the diluvian. But imperfect as are the data of geology, in this regard, the fact of the gradual increase of the dry lands is none the less placed beyond a doubt.

The largest domain, then, above the surface of the water, in the regions of the future continent of Europe, was Scandinavia, and a part of Russia. England and Scotland are only marked by a few islands along the existing western coast; Ireland, by a few others, placed at the corners of the present island. All France is represented merely by an island, corresponding to the central table land of Auvergne, and by some strips of land in Vendée, in Brittany, and in Calvados. In Germany, Bohemia forming a great island, the Harz, and the plateau of the Lower Rhine; small portions of the Vosges, and of the Black Forest, and some low lands on the spot occupied by the Alps, between Toulon, Milan and Tyrol, compose an archipelago which is to become [illegible] of the continent. All the regions of the South, [illegible] a few small portions of Spain and of

[illegible]poch when the coal deposits [illegible]er, made up of a few islands [illegible]but less numerous, less [illegible]Europe at the same [illegible]the present north- [illegible]of the Alleghanies [illegible]north-west of the

Valley of the Mississippi, and forms a species of small continent, in the interior of which are three large inland seas, or three large swamps, where the plants are vegetating that compose the great coal deposits of the present day. A similar sea doubtless lay between Nova Scotia and Newfoundland, bordered, perhaps, by lands which have disappeared beneath the waves. All the great belt of low lands along the Atlantic coast and the Gulf of Mexico, including Florida, did not exist; the ocean formed a deep gulf, running up the Valley of the Mississippi one half its length.

Fig. 3.



America at the Coal Epoch.

The vast plains west of the Mississippi, the Rocky

Mountains, the table lands and the high snow-capped chains from California to the Frozen Ocean, were still at the bottom of the sea.

This augmentation of the number of the islands, their clustering in archipelagos, is certainly a progress; there is still, however, but little variety; the mountains are few in number, and slightly elevated; the valleys traced but indistinctly or not at all; the slopes imperfectly determined; extensive low and swampy regions indicate still the preponderance of the watery element. A thicker and denser atmosphere equalizes the temperatures. One species of climate alone, the maritime or insular climate, moist, without extremes, reigns over land and sea. No great continents, none of those elevated masses which give to climate extreme and variable temperatures, and the character of dryness; none of all those varied forms of vegetation which show themselves later under its influences.

The organized beings corresponding to this physical condition of the surface of the globe, show with the utmost clearness this character of uniformity and inferi-

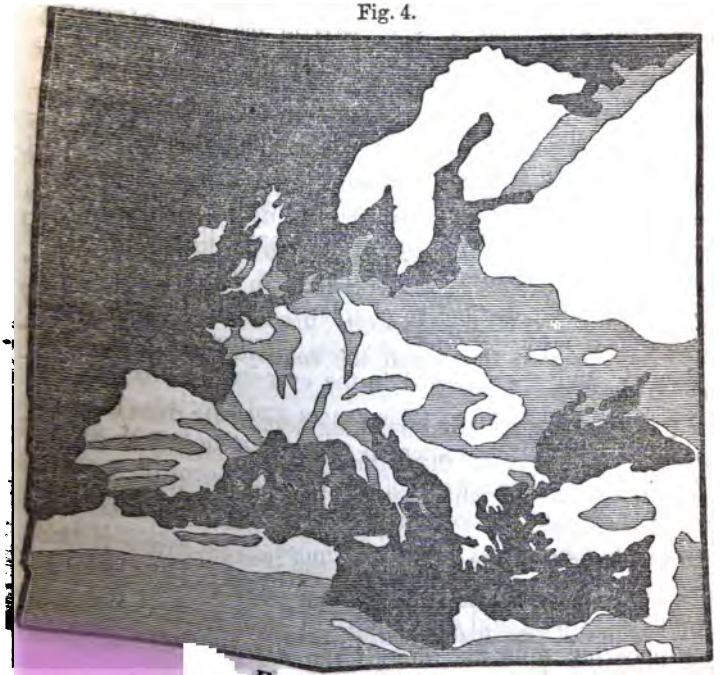
From one extremity of the earth to the other, the Silurian epoch are found identical in ...ce in America, in Europe, in Africa, ...nd. The vegetables, accumulated in ...me at the poles and the equator. ...ings are not only few in ...ing to those which mark ...l life; and in each class, ...hes, the highest beings of ...prevailing forms are those

e early periods o its
merous Crinoids, he
l, in the fishes, the
Such are still the great
s epoch, and in the
horse-tails, (Equise-
coniferous trees, the
compose the immense
has deposited for the
human industry. The
s belong to the inferior
the third to that of the
coniferous, is scarcely

here in its details the
of the surface of our earth, and of
ly appear; this is the
only, that one of the
the demonstration that
the variety of the types
became always greater
is a new progress;
another; one surface after
existing dry lands; one
appearing and binding
ds. The terrestrial
eir contours are
up.
rt. representing
Tertiary epoch.
rian epoch, we

shall be able to form an idea of the change that has been wrought. (See Fig. 4.)

Fig. 4.



Europe at the Tertiary Epoch.

umber of the lands has been multiplied,
here the primitive islands have been enlarged
entre of the continent, Germany
eady a considerable collective
a few interior basins. The
two or three large islands,
ngland only is wanting. The
south are clearly traced; Italy

[illegible] is still exposed along its coast to the encroachments [illegible] sea. Scandinavia continues to form a large soli[illegible] mass. Its mountains are more elevated; the Pyre[illegible] its appendages, a small part of the Alps, already [illegible] the great features of relief which characterize [illegible].

[illegible] the present epoch, the variety of physical cir[illegible] is still increasing: a multitude of isolated [illegible] of Paris, of London, of Oeningen, [illegible] and have their separate [illegible] physical regions are determined, [illegible] character. The climates are [illegible] the physical circumstances of a [illegible] the ever-increasing diver[illegible] genera and species.

[illegible] *specialization* is not going [illegible] masses of earth, while becoming more [illegible] more diversified in shape, are [illegible] more and more, the contours of [illegible] are getting better defined: the tertiary [illegible] up. The water of the seas [illegible] the atmospheric waters, [illegible] place, scoop out [illegible] equalize the soil [illegible] rium. The dilu[illegible] emporaneous [illegible] oil and the [illegible] ly repay [illegible] receive its

[illegible] plicity, this

diversity of successive elevations is combined into a few great units, a few continents; these in turn are grouped in two worlds and form an organism, with some of the features of which we have already become acquainted.

This same progress is confirmed by palæontology, through all the successive ages of nature. The variety and the perfection of the types and species keep pace with the increasing diversity of the lands and the seas, and all the physical circumstances which serve as the basis and the condition for the life of plant and animal. In the *insular* or oceanic epoch, that of the palæozoic strata, we have seen animals entirely marine prevailing, and forming the inferior and embryonic types of the four divisions of the animal kingdom; it is the reign of the fishes, if we take the vertebrates as the type of development. During the formation of the secondary strata, which I would call the *maritime* epoch, on account of the great land-locked seas that characterize it, the huge reptiles, the monstrous Saurians of the Jurassic waters, are the prevailing form, and by their amphibious habits mark at once their more elevated position in the animal scale, and the increasing force of the land element. The numbers of living genera and species are much greater than at the palæozoic epoch, but the same types are still uniformly spread over vast spaces.

The tertiary epoch, which I would call the *continental* epoch, beholds the appearance of the superior animals, the mammifers, the life of which is almost exclusively attached to the solid land. The continental element triumphs; all the faunas become localized; each country of the globe has its appropriate animals; the variety of

[illegible] to infinity.
[illegible] of man, who
[illegible] of the
[illegible] progression
[illegible]

[illegible] we have
[illegible] recognize a
[illegible] first
[illegible] and the
[illegible] of the ani-
[illegible] law that
[illegible] do we not see,
[illegible] of ele-
[illegible] their definitive
[illegible] Yes, gentlemen,
[illegible] difference
[illegible] of

[illegible] numerous: let us
[illegible] are chiefly

[illegible] land,

the most diversified forms, the most numerous contrasts, and the best characterized natural regions. There is here the same relation as between the inferior animal without special organs, and the superior animal richly furnished with special organs.

4. The result of all these differences of forms, of climate, of vegetation, of all the internal and external contrasts, considered in each of the great terrestrial masses, in each continent, is to impress upon every one a special character, a peculiar life, so that they appear as so many individuals, differing from each other, and designed to enter into relations of intercourse and of reciprocal influence.

5. Considered under various aspects, in the point of view of their analogies and their differences, the great terrestrial masses are combined in groups of continents, according to characteristics of the same nature. Now these groups, compared together, present an assemblage of distinct and opposite characters, and seem to form [illegible] *contrasts*, two by two. Thus the two continents of America have, notwithstanding the immense differences [illegible] common characters, binding [illegible] distinguished, as such, from [illegible] three or four continents. [illegible] continents of the north, [illegible] the south.

[illegible] life [illegible] then developed [illegible] might name *the* [illegible] phenomena of the [illegible] being combined

into grand differences, opposed two to two, we may call it *the law of contrasts.*

It is, then, under the form of great contrasts, the sources of a multitude of vital actions, that we shall henceforth consider the continental masses. Now, let us point out the three most important of them.

1. The contrast of the continental hemisphere, and the oceanic hemisphere, or land and water.

2. Of the Old World and of the New World.

3. Of the three northern continents and the three southern continents.

In studying the globe in this point of view, we shall see it under a new light. I know I am stepping a little out of the beaten paths. This is not, believe me, gentlemen, the result of a passing momentary glance, but of patient studies in detail, in the realm of nature and of history. We shall have the pledge that it is not without value, when we trace in each of these contrasts all the great analogies and differences we have thus far shown, each in its place, in its true light, and with the just portion of influence they are respectively entitled

ing forth these contrasts, this antagonism
ne globe against the other, let us hasten to
e is nothing hostile in the conflict; for it
True victory is not to crush
him a friend. We suspect
of life declares it, — we sus-
these oppositions resolve them-
nony, wherein each continent
while all live at the same time a

common life. But to arrive at this final result, nature alone is not sufficient; there is needed something more than a physical tie between all these parts of the world; there is needed a moral bond; a soul is wanting to this body, to set its organs in action. Now, it is man, it is human societies, that alone can animate the great frame, bind together all the parts, and render perfect that organism which is the end and aim of the long procession of existence upon this earth.

LECTURE V.

The north-east or continental hemisphere, and the south-west or oceanic hemisphere — Land and water — Differences in the forms of the surfaces — Continental climate and sea climate — Their different influences upon the vegetation and organized beings — The ocean, the superior element, the terrestrial element the superior — [illegible] — Transportation of the waters of the ocean to the continents — The atmosphere the mediator between them.

GENTLEMEN, —

We have examined the reasons that have led us to consider the general phenomena of the life of the globe as having their source in certain great contrasts, of which we have especially distinguished three: the continental hemisphere opposed to the oceanic; the Old World to the New; the three northern continents to the three southern.

[illegible] commence the investigation of [illegible] terrestrial element with the [illegible] certain the special characters [illegible] ture by what means, and [illegible] riations combining and [illegible] ure. We shall see, [illegible] py and important [illegible] f the land and the

In speaking of the distribution of the lands on the surface of the globe, we have already said that the most characteristic and general trait in this respect is their prevailing concentration in one hemisphere alone, so that the whole world is divided into two great regions; one over which the ocean reigns, the other which the terrestrial masses command by their number, their size, and their connection. Now, the equator divides the globe into a northern and a southern hemisphere, very different, in this respect, from each other. But if, with Ritter, we draw a great circle, passing at once over the western coast of Peru and the peninsula of Malacca, at the southern extremity of Asia, the contrast is more complete still, (See Fig. 1,) and the globe is cut into a north-eastern hemisphere, (if we take the Old World for the eastern,) comprising five of the continents, and the largest; and a south-western hemisphere, where we see hardly anything but oceans, and, in the midst, floating solitary, the most insular of the continents, Australia. The southern point of America and the islands of the Pacific Ocean are the only lands which, with this continent, represent the continental element in this oceanic world.

[illegible] one of the sides of our planet is the humid, aque-
the terrestrial side.
[illegible]atime, the characters which distin-
[illegible]lements, in the point of view of phys-
with the exterior forms.
[illegible]quid element has no form
[illegible] spherical form of the drop
[illegible]n the earth, the waters of
[illegible]as a plain uniform surface,

nearly the same, over and over again, from one end of the world to the other?

A difference no less important, between the seas and the lands, is that of the climate. It is owing substantially to the peculiar physical properties of the water and the soil of the continents. Water has a great capacity for heat, but a feeble conducting power; it grows warm but slowly in the rays of the sun. The evaporation being considerable, produces a cooling, which tempers further the heat received at the surface. Finally, the cooler particles of the lower layers, set in motion by the waves and the currents, incessantly fill the place of those of the superficial layer, and prevent it from rising to a high temperature.

It is the same with the cooling. The superficial layer growing cool, whether by the absence of the sun, or by contact with a colder atmosphere, the cooled molecules become more heavy, fall lower, and give way to the warmer molecules of the inferior strata. This motion is incessantly repeated, and singularly retards the process of cooling.

Thus the heating and cooling are less sensible and more slow, and do not reach the extremes. The air contact, shares in the uniformity belongs to the surface of the combined with the abundance of atmosphere, gives to the sea

surface of the soil, whose rapidly absorbs the solar the more heated, since it

cannot be displaced, as in the water, by another, and it soon attains an elevated temperature. But, for the same reason, the ground easily loses heat by radiation, whether during the nights or the clear days; and the loss is so much the greater, as the radiation is favored by the inequality of the surface, and the transparency of an atmosphere more dry and less charged with clouds. The lands removed from the influence of the oceans have, then, a climate characterized by the extremes of cold and heat, by more violent changes, and a drier atmosphere. These are the essential features of the continental climate. If the former is *constant*, the latter is *excessive*.

If we now observe the manner in which sea and land are affected with regard to their temperature, when near each other, and receiving the same quantity of heat from the sun, we notice that the sea is colder than the land during the day, and warmer during the night. In the same way, taking the different seasons of the year, in summer the sea is colder than the land, in winter it is warmer. It preserves the mean temperatures, while the land experiences the extremes. It tends to soften all the ... to establish uniformity of cli-

...les, as far as possible, of the
...ds, subjected to the influence
...ate of places in
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...nated, two by
...y in latitudes
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mission to cite the numbers in degrees of the centigrade scale, which it would be very desirable to adopt uniformly, at least in matters of science, if not in the common usage of daily life. Nevertheless, for the sake of clearness, I will add the corresponding value in degrees of Fahrenheit. The differences, which are here the important thing, are found in two separate columns.

Let us first compare the climate of the Färoe islands, situated in the midst of the Atlantic, with that of Petersburg, and, if you please, of Yakutsk, in the depths of Siberia; and, to form an idea of the extent of the thermometrical variations each of these climates undergoes, let us establish the difference between the mean temperature of summer and winter, in each of them. These three localities are situated in the high latitudes, between 60° and 62° north lat.

		Winter.	Summer.	Difference deg. Cent.	Difference, deg. Fah.
Färoe, ...	Cent.	3.6	12.2	8.6	
	Fahr.	38.5	54.0	...	15.5
Petersburg,	Cent.	-8.7	16.0	24.7	
	Fahr.	16.3	60.8	...	44.5
Yakut		-38.9	17.2	56.1	
		-38.0	63.0	...	101.0

W
...
into ...ase of the differences, how
If ... proportion as we advance
the ...ents.
be. ...of the coldest with that of
...me places, the proportion

					15.2
					48.9
					105

[illegible] just [illegible] highest degree of heat [illegible] 93.3 Fahr., [illegible] while the meteorologi- [illegible] maximum means of 81.4 and [illegible] 101 Fahr. [illegible] and the heat [illegible] between [illegible] mild of at [illegible].

[illegible] the [illegible] a [illegible] vio- [illegible] the same day.

[illegible]rance, on [illegible] at the [illegible]:

The differences, as we see, are still considerable, but less than between Färoe and Yakutsk.

Nearer the tropics, the climate of Madeira, compared with that of Cairo, in lat. 32° and 30° N., indicates a similar proportion.

		Winter.	Summer.	Difference, deg. Cent.	Difference, deg. Fahr.
Madeira,	Cent.	16.3	21.1	4.8	
	Fahr.	61.3	70.0	. . .	8.7
Cairo,	Cent.	14.7	29.2	14.5	
	Fahr.	58.5	84.6	. . .	26.1

The differences between the seasons become less in the two localities respectively; but the influence of the ocean and the continent is always very marked. The difference between the extreme temperature, at Madeira only from 12° to 15° C. or 20° to 27° F., is in Egypt 31° C. or 56° F.

In the Sahara, ice has been known to form by the intensity of the radiation, and the heat to rise, by the wind of the desert, to the enormous height of 118° F., or 48° C.

I will give one example more, and it shall be taken from Asia, between 31° and 32° N.

ner.	Difference, deg. Cent.	Difference, deg. Fahr.
	8.9	
	. . .	16.0
	15.4	
	. . .	27.7

[illegible] it is because [illegible] near the ocean.

We see, then, how great is the influence of the sea upon the distribution of the temperature in the different seasons of the year and in the course of the day; how it tends to equalize the extremes together, and to maintain in all times an equality of temperature.

Island climates are thus equal, uniform, moist; the sky often cloudy, as there is in the high latitudes. The land climate is extreme, irregular, with violent changes, dry; the sky usually clear.

The astronomical climate, caused by the latitude, is thus greatly modified by the presence or absence of the sea, and the distribution of heat through the year, for any place whatever depends essentially on its proximity to, or distance from, the ocean, and the relative frequency of the winds that blow from them.

Who does not see the powerful influence such differences in the climatic conditions must exercise on all organized beings, and on vegetation in particular? While, in green Ireland, the myrtle grows in the open air, as in Portugal, without having to dread the cold of winter, the summer sun of this same climate does not succeed in perfectly ripening the plums and the pears, which grow very well in the same latitude on the continent. On the coasts of Cornwall, shrubs as delicate as the [illegible] camelia, are green through the whole year [illegible], in a latitude at which, in the interior of [illegible], [illegible] the most tenacious of life can alone [illegible] the winters. But, on the other hand, the [illegible] cannot ripen the grape, almost

under the same parallel where grow still the delicious wines of the Rhine. At Astracan, on the northern shore of the Caspian, Humboldt says, the grapes and fruits of every kind are as beautiful and luscious as in the Canaries and in Italy; the wines have all the fire of those of the South of Europe, while in the same latitude, at the mouth of the Loire, the vine hardly flourishes at all. And yet, to a summer capable of ripening the southern fruits, succeeds a winter so severe, that the vine-dresser must bury the stock of his vines several feet beneath the earth, if he would not see them killed every year by the cold. Who does not remember that a part of the Russian army, despatched for the conquest of Khovaresmia, perished under the snows, and by the colds of 20° below zero of Fahrenheit, in a country situated under the same parallel as the Azores, where reigns a perpetual spring, and where, in the midst of winter, the vegetation and the flowers display their most brilliant colors? It is there that the camel, the inhabitant of burning deserts, and the reindeer of the frozen regions, meet together, and nature seems to have combined the contrasts of the climate of the poles and of the tropics.

The oceanic climate, considered in the islands truly pelagic, favors the growth of an abundant vegetation, with large and numerous leaves, but little varied. The flora of the oceanic islands, whether from this cause or others pertaining to the mode of dissemination of the plants, is scanty in species. The animal world is still more limited; all the large animals, the lion, the elephant, the rhinoceros, are wanting; the continental

islands form an exception, we conceive, because they are much more closely united to the continent than to the ocean.

On man himself the influence of this moist and soft climate makes itself felt by a relaxation of the tissues, by a want of due excitement. The insular Polynesians, as those of Tahiti and others, always exhibit the [illegible] and careless character which seems to be [illegible] the result of such a climate.

The continental climate does not give to the vegetation the luxuriance of such exuberance, but the variety [illegible], the frequency of alternances of plains, of [illegible] mountains, of valleys of different exposures, produces an almost infinite variety of different species and forms. The dryer and warmer air [illegible] elaborates them better, [illegible] and gives them that strong and aromatic [illegible] which the plants of the oceanic islands rarely [illegible]. The animals are more vigorous and larger there, [illegible] more numerous, the types more varied. The [illegible] and the wings of the brute [illegible] elsewhere than under the sky [illegible] continental islands. Man [illegible] more intelligent, [illegible] in a word, he is more [illegible], by the variety and [illegible] the contrasts that [illegible] this climate.

[illegible] is revealed to us, [illegible] and the organized [illegible] in the main lends

to uniformity, the other to variety. But please to remark, gentlemen, they are not only different from each other, but they stand, moreover, in the relation of superior and inferior.

The terrestrial element has for its portion an infinite variety of the forms of relief, of climate; it is the seat of a more varied life; the birthplace and the habitual abode of all the superior beings, from the vegetable up to man. The ocean has uniformity for its characteristic; it is the domain of the inferior beings, from the polype to the fish and the amphibious animal. Thus we have seen, in the geological development of the surface of our globe, the oceanic element first prevailing, as the less perfect. The oceanic epoch is the embryonic epoch; the insular epoch, analogous to the present oceanic world and its climate, is the second step in the physical life of the globe; the continental epoch, or the present epoch, alone carries it to the highest degree of development.

And yet the ocean much surpasses the continents in extent; it occupies more than two thirds of the surface of the globe. But this even is a sign of inferiority; for mass and number, as we see in all the kingdoms of

ong to the superior being.

ntlemen, we know, in their characters
ntrast, the continental hemisphere and the
e land and the water. Two
fronted; they cannot remain
ct and react, and impart their
We are so much in the habit
ments, the dry and the moist,
ing one another, that we have

We

borne along by the winds, whether invisible still, or in the state of clouds, they spread themselves over the continents, and fall in abundant rains upon the ground which they fertilize. All the portion of the atmospheric waters not expended for the benefit of the plants and of the animals, nor carried off anew into the atmosphere by evaporation, returns by the springs and rivers to the ocean, whence it came.

Thus the waters of the ocean, by this ever renewed rotation, spread themselves over the lands; the two elements combine, and become a source of life, far richer and much superior to what either could have produced by its own forces alone.

But we see the earth and the water, the continents and the oceans, touch each other only at their margins A more intimate action upon each other is not possible, except by means of the most mobile of the elements, the atmosphere, performing, in nature, the part of mediator. The winds are the instruments of this important work, the bearers of this wondrous water which renovates unceasingly the face of the main-lands, and sustains their beauty. Unhappy the countries to which th

still charged with some parts of their

inhabitants of the desert can

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lobe, is to study the

carriers; to this sub-

our

LECTURE VI.

The study of the distribution of the rains supposes that of the winds — Difference of temperature the principal cause of the winds — Theory of the general winds — The winds of the tropical regions — Trade wind of the Pacific Ocean — Trade wind of the Atlantic — The monsoons of the Indian seas — The winds of the temperate regions — The general currents, the return trade wind, or equatorial wind, and the polar currents — The counter trades, and the variable winds — Causes and effects of the currents, and their influence upon the temperature, the productions of the soil, and commerce — The law of the variation of the winds — The atmospheric water falling back in rain — Circumstances favorable to the precipitation of vapors — The rains of the torrid zone — The rains in the region of the monsoons — Annual quantity of the rain under the tropics — Distribution and annual quantity of the rain in the temperate regions.

LAWS AND CAUSES —

After having ascertained the characters of the two [illegible] the oceanic and continental, we have asked [illegible] how they acted upon each other, how the [illegible] the oceanic climate spread over the conti- [illegible]. We have seen that the atmos- [illegible] in this part of mediator, and [illegible] the wings of the winds to the [illegible]. To study the distribution [illegible] of the most essential features [illegible] as we said, to engage in [illegible] of the atmosphere, and the

general system of the winds. This double study will be the more important, as it is intimately connected with the variations of the temperature, so that it will be almost sufficient to give us an idea of the principal kinds of climates presented by the different countries of the globe.

If we knew only the winds that blow in our temperate regions, we should almost despair of arriving at the knowledge of any law regulating their course. What is more fickle, more capricious, than the winds, which suddenly change their direction, their force and temperature, without apparent cause, and inaccessible to our means of observation? They are the symbols of changeableness itself. But it is not so when we enter upon the equatorial seas, where, from one end of the year to the other, a gentle and regular wind blows from the east to the west with great constancy, and carries slowly and without violence the ships from the coasts of the Old World to those of the New; these are the *trade winds*. We know the astonishment and alarm of the companions of Columbus on noticing these winds, the constant direction of which towards the west seemed to render their return impossible. In the East Indian seas, the winds blow six months from the north-east, and six ·hs from the south-west. These are the *monsoons*.

·ai ty of the tropical winds indicates the ex-
·ermanent causes, of which it is, perhaps,
ive some account. At any rate, the phe-
.es a certain course, annually repeated, of
·ight to take cognizance; for, in case of
:o wledge of the flow of the atmospheric

currents independently of their causes, may be sufficient

for our purpose.

The winds are the consequence of a disturbance of

equilibrium in the layers of the atmosphere; and the

function of their motion is to restore the equilibrium

which has been destroyed: as soon as that is accom-

plished the movement ceases and everything settles into

[illegible] more we study the causes of these disturbances

[illegible] to restore equilibrium, and of the winds, the

[illegible] we see that they are reduced, essentially, almost

[illegible] to differences of temperature between neighbor-

[illegible] [illegible] the law of differences is the

[illegible] [illegible] condition of life.

[illegible] [illegible] of the equilibrium of

[illegible] [illegible] the lower layer of the atmosphere

[illegible] [illegible] at all points. If this

[illegible] [illegible] the denser portions flow under

[illegible] [illegible] rise to the top. Now,

[illegible] [illegible] parts of the layer are

[illegible] [illegible] greater warmth the

[illegible] [illegible] pressed by the

[illegible] [illegible] The result of this

[illegible] [illegible] and lateral currents

[illegible] [illegible] spot where the tem-

[illegible] [illegible] an example in

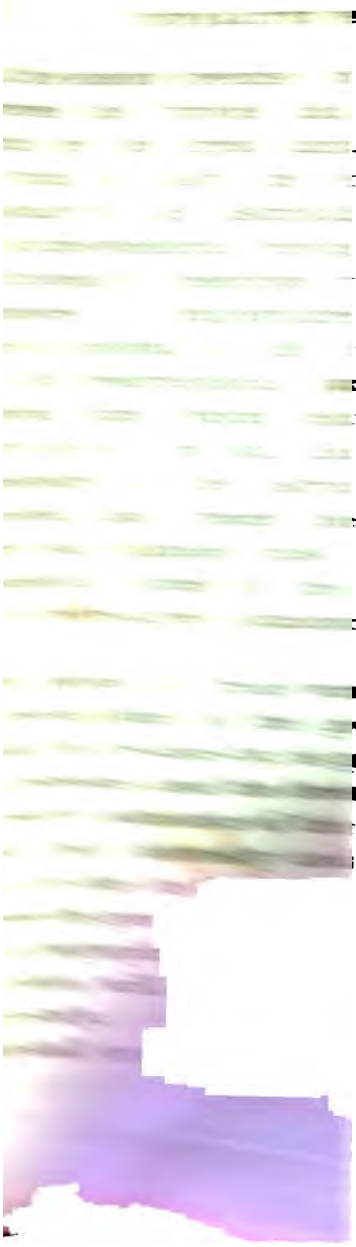
[illegible] [illegible] alone in the

[illegible] [illegible] more readily

[illegible] [illegible] above the

horizon, the island becomes warmer than the neighboring sea. Their respective atmospheres participate in these unequal temperatures, the fresh air of the sea rushes from all directions under the form of a sea breeze, which makes itself felt along the whole coast, and the warmer and lighter air of the island will ascend into the atmosphere. During the night, it is the reverse. The island loses heat by radiation, and cools quicker than the sea. Its atmosphere, having become heavier, runs into that of the sea, under the form of a land breeze, and this interchange lasts until the temperature, and consequently the density, of the two atmospheres have again become the same. This is the phenomenon observed almost daily on nearly all the seaboards.

What takes place here on a small scale in the space of a day, passes on a great scale between an entire continent and the ocean from one season to another, between the tropical regions and the temperate and polar regions in a permanent manner. Southern Africa is fiercely heated by the rays of a summer sun, while the seas of India and Asia experience the low temperature of the winter. The temperature of the tropics is almost
, and constantly higher than that of the
To each of these differences of tem
al in duration and amount, particular
ts, which are their consequence,
rence of temperature between
ial breezes, whether along the
of the continents, at the foot of
ifference of temperature between
ie monsoons, which one might



winds, which may be called primitive, of first importance, and which embrace, so to speak, the entire atmosphere. In order to unfold this subject, I shall present the theory generally received by the most eminent meteorologists; that proposed by Halley and Hadley. Not that it is perhaps unassailable in the details, for we encounter many difficulties when we undertake to account by physical laws for the manner in which these great compensations are effected; but the foundations of the hypothesis seem beyond a doubt, and the course of the phenomenon it teaches us to understand is here of the greatest importance.

Let us consider the entire atmosphere as only one of these horizontal layers of air of which we have recently spoken. We see that one of the principal conditions of equilibrium of the molecules does not exist, since the different parts of it are unequally heated. The regions near the equator have a high temperature, and the heat goes on gradually diminishing in proportion as we advance towards the poles. The atmosphere of the tropical zone is more dilated, and consequently lighter, than those of the temperate and polar regions. The height of the barometer at the level of the ocean, which measures the pressure of the atmosphere, is in fact less at the equator than in the temperate regions. We have seen that the column of mercury, corrected for gravity, keeps at a mean height of 760 millimetres, while it is 761 in the latitudes. The difference of three millimetres is due to the force which incessantly

impels the air of the temperate regions towards the region of the equator.

What is the consequence of this dynamic state of the atmosphere? The denser air of the colder regions presses that of the hot on two sides, the north and the south; the tropical atmosphere rises, and here two lower currents are established, from the poles to the equator, and two superior currents, which conduct the air of the equator towards the poles, to commence again the same rotation. We ought, then, to find, in the northern hemisphere, a general wind coming from the north, and in the southern hemisphere, a wind coming from the south. But the motion of the rotation of the earth from the west to the east exercises an influence upon the direction of these currents, causing them to deviate from their original direction. The speed of rotation, almost nothing in the neighborhood of the poles, becomes greater for any place in proportion to its proximity to the equator. The masses of air rushing towards the equator have then an acquired speed less than that of the regions towards which they are directing themselves. At each step they are obliged to assume a greater rapidity

of [illegible] in virtue of the law of inertia, a [illegible]ary for this to take place, they find [illegible]ep a little behindhand, that is, they [illegible]e west than would be the

These successive re-
e little by little the direc-
south of the northern
rection; and the direction
th of the southern hemi-

sphere, into a north-west current. These two general currents, of north-east and south-east, to call them, according to the usage, by the places whence they come, encountering each other in the tropical zone, combine together, and there results a general current from east to west, the great trade wind. The region where the two currents meet is in a kind of equilibrium, and it is marked by *a zone of calms.*

The same cause makes the upper currents, setting from the equator towards the poles, swerve, but in the opposite way. They arrive successively in the higher latitudes, with a velocity of rotation greater than they find there, and are always a little in advance of the earth's motion in each place; that is, they swerve always more and more to the east. There will then result a current bearing to the north-east, or a south-west wind, in the northern hemisphere, and a current bearing to the south-east, or a north-west wind, in the southern hemisphere.

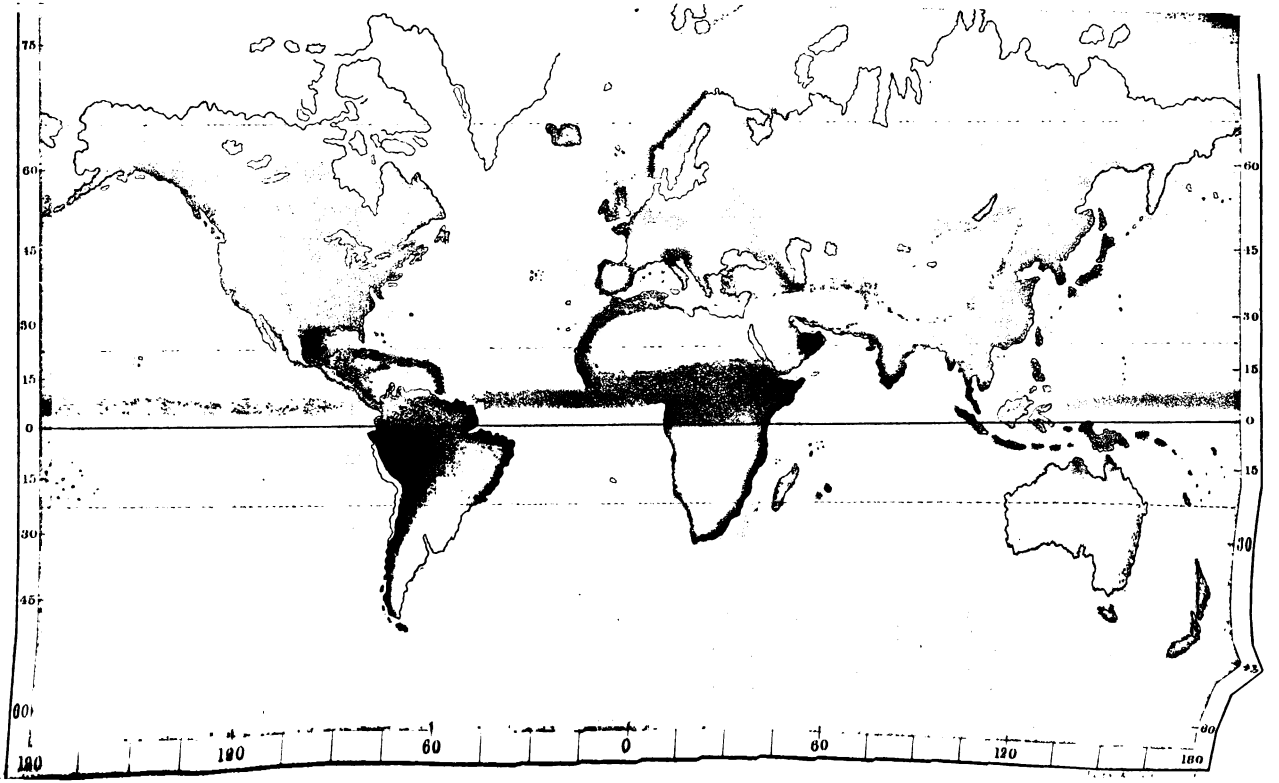
The general course of the winds would doubtless show itself in all its regularity if the surface of the globe presented only the uniform surface of the oceans. But the presence of the continents and their disposition modify trade winds in many ways, and make the question complicated. Let us examine the principal of these tions beginning with the trade wind of the In this zone the regularity is greater causes are easier to detect.

ıe tropical regions might be reduced to al trade wind, blowing regularly from round the globe, if the continents did

not bar its passage and disturb its course at numerous points. The continental lands impede its march, and cut it, so to speak, into several pieces. The trade wind of the Pacific Ocean is arrested by Australia; that of the Indian Ocean by Africa; that of the Atlantic is stopped by America. We shall then rapidly examine the courses of the trade wind in each of these oceans; for it is essentially at the surface of the ocean, where it reigns supreme, that we can learn its true character.

The trade wind of the Pacific begins to make itself felt at a certain distance from the western coasts of America, and blows almost without interruption as far as the coasts of Australia. The north-east current is regular between 2° and 25° north latitude, which may be considered as the southern and northern limits. But in the summer it rises a little further towards the north. It was this constant and gentle wind that carried the first navigator, Magalhaens, whose ship made the voyage round the world, across this vast ocean, and that gave it the name of Pacific, which has been preserved to the present day. It is by this line still, that the Spanish galleons, laden with the gold of the New World, accomplished, during more than two centuries, their peaceful voyages from Acapulco to Manilla, sheltered at once from the tempests and from the attacks of the nations envious of so much wealth. The south-east current is as regular south of the equator, but the limits are less known; it is found as far as the 21° of south latitude.

The region of calms is found in the space comprised between the 2° [illegible] ude and the 2° south, between the two cur[illegible]eeting. Here the ascending


75
60
45
30
15
0
15
30
45
60
180
120
60
0
60
120
180

ent seems to neutralize the horizontal; the air is
a sort of factitious equilibrium, that the least acci-
t violently disturbs. Thus, to a dead calm, suc-
d those sudden tempests, those violent squalls, those
irlwinds, those tornadoes, as the Spaniards call them,
ich are the terror of navigators. Thunder storms,
ompanied by showers, are of almost daily occurrence.
The trade wind of the Atlantic is already modified by
e position of this ocean lying between continents nearer
each other. It is, as it were, transported bodily several
egrees towards the north. The northern limit of the
orth-east current is precisely fixed by the numerous nav-
gators who traverse these seas; it commences between
8° and 30° north latitude. Its southern limit is about
° north latitude. The region of calms occupies, on
the average, the space comprised between the 3° and
8° of north latitude; but its position varies with the
seasons; in August it extends from 3° to 13° north lati-
tude; in February, from 1° to 6° north latitude. The
south-east current always blows, then, beyond the equa-
tor to the north.

Humboldt attributes, apparently with reason, this anomaly, on the one hand, to the direction of the coasts of South America, which favors the extension of the south-east trade wind, and of the warm waters of the great equatorial current towards the north; and, on the
to the cooling influence of the high mountains of
nent, in the regions of the equator. The first
causes tends to heat the sea of the Antilles; the
to lower the temperature of the southern continent.
esult of this difference must be to determine a cur-

rent of air from the south, removing the limit of the north-east trade wind further north. The thermal equator, or the line of the greatest mean heat, passes, in fact, through the south of the sea of the Antilles.

The existence of the upper trade wind, coming from the west, or of the return trade wind, which has often been doubted, seems to be proved in this ocean by two facts, often cited and very conclusive. The volcano of the island of St. Vincent, belonging to the lesser Antilles, in one of its eruptions hurled a column of volcanic cinders to a great height in the atmosphere; the inhabitants of the Barbadoes, situated east of St. Vincent, saw, with astonishment, the cinders falling in abundance upon their island. The 25th of February, 1835, the volcano of Cosiguina, in Guatemala, threw into the air such a quantity of cinders, that the light of the sun was darkened during five days; a few days after, they were seen to cover the streets of Kingston, in Jamaica, situated north-east of Guatemala. In these two cases it is evident that the cinders had reached the region of the upper trade wind, and had been carried by it from west to east, in the opposite direction to the lower trade wind. At the summit of the Peak of Teneriffe, most travellers have found a west wind, even when the north-east trade wind prevailed on the seaboard.

The winds of the Indian Ocean experience still greater perturbations than those of the other two oceans of the tropics. If I have elsewhere called the Pacific the most *oceanic* of [illegible] Atlantic the most *maritime*, I shall call [illegible] the most *mediterranean*. It

is, in reality, only a half ocean, a great gulf, surrounded on the sides by huge continental masses; the mighty Asia, with its peninsulas and its table lands, on the north, Africa on the west, Australia on the east. Asia prevents the oceanic trade wind of the north-east from arriving there, and the influence of the lands and of the vast plateaus remains greatly preponderant. Thus the movements of the atmosphere depend upon the unequal heating of the neighboring continents during the extreme seasons of summer and winter, which are opposite in the continents situated in the north and in the south. The eastern trade wind in this way changes into a sort of double semi-annual breeze, blowing regularly six months in one direction, and six months in another; this is called *monsoon*, from the Arabic word *moussin*, signifying season. It will be easy to understand this effect, if you call to mind what we have said of the land and sea breezes, that spring up on the islands and along the sea-shores.

While Africa, south of the equator, receives the vertical rays of the southern summer sun in December, January, and February, Southern Asia on the north of the equator, and the neighboring seas, are feeling the low temperatures of winter. The air rushes in from the colder regions of the Indies and of Upper Asia towards the warmer regions of Southern Africa, and the trade wind is transformed into a north-easter, which blows as long as this difference of temperature lasts. It is for India the winter or north-east monsoon. The reverse takes place when India and Asia are heated by the burning sun of the northern summer, and when Africa is cooled by the southern winter. The air blows towards

[illegible]

[illegible] New Zealand. But it is [illegible] than the Indo-African [illegible] was it Southern [illegible] and the great archipelago of Sunda and of the [illegible] their position lasting at the same time the [illegible] mind of the great ocean, and of [illegible] of the hurricanes of the Indies and [illegible] that we must seek in this [illegible] and typhoons [illegible] any other upon the [illegible]

We see that the great trade wind does not exhibit its normal manner, except in the Pacific Ocean, far from the land. It is driven towards the north in the valley of the Atlantic, or is entirely broken up in the Indian Ocean. The influence of the lands cannot be mistaken.

Let us pass to the winds of the temperate regions and of the middle latitudes.

Here, as we have said, the regularity disappears by degrees; the secondary influence assumes more importance still; it is the theatre of the incessant conflict between the polar winds and those of the tropics. They blow alternately, without any well established rule, and pass, often abruptly and without transition, from one point of the horizon to another. If the equatorial regions are those of the *constant and periodical* winds, the temperate regions are those of the *variable winds*.

Nevertheless, when we compare the number of times the winds blow from each quarter of the horizon during the course of a year, we discover that in the northern hemisphere two directions tend to prevail over all the others, and those are the winds from the west and south-west, and from the east and south-east. It is known that in the northern Atlantic the west winds prevail to such a degree that the average passage of the packet ships from America to Europe is only from twenty to twenty-three days, while from Europe to America it is from thirty-five to forty.

It is generally agreed to consider these winds from the south-west as having their origin in the return of the air of the tropics. The upper trade wind cools in the high

[illegible]

[illegible] and of the return of the trade wind
[illegible] again for the Pacific Ocean. The
[illegible] and south-west prevail in the middle
[illegible] rn coasts of North Amer-
temperature belonging

to them. Sitka, in Russian America, at 57° N. lat., has the same average temperature with the shores of Lake Ontario, 44° N. lat., but much milder winters; the valley of the Columbia, in Oregon, already displays the most verdant prairies; while, under the same latitude, Lake Superior presents only snow and ice, and the whole desolate aspect of an arctic region.

It is, then, to the normal direction of the return trade wind that we must refer the well-known phenomenon of the higher temperature of the western shores of the continents of the two worlds, compared to that of their eastern sea-boards. But, for the same reason, this difference, though very great in the high latitudes, disappears by degrees as we approach the tropics.

But the air of the polar countries, tending continually to flow towards the warmer regions, gives birth to currents, the normal direction of which is from north-east to south-west, from the cause we have already explained. These north-easterly currents follow, by preference, the path of the continents, as the currents of the equator follow that of the ocean. They have the cold temperature of the places whence they come, and unless high mountains interpose an obstacle, they refresh the continental regions for a great distance. Cast a glance upon this map of Europe, where the lines of equal mean tem- are traced, (See plate I.,) and you will see them bending towards the south opposite to the broad pened to the polar winds between the Caucasus mountains of Transylvania; that is, all the the Black Sea, the northern coast of Asia eastern coast of Greece, owe to them a lower

[illegible] the [illegible] of the [illegible]
[illegible] [illegible] [illegible] [

vance towards the north, it is by reason of its form and of the disposition of its shores, approaching each other towards the south and greatly diverging towards the north. The western coast and the Rocky Mountains trend thus to the north-west; the Atlantic coast to the north-east. Now, supposing the mass of air, turned aside by the Rocky Mountains, to advance from west to east on a line nearly parallel to this chain, it first strikes the Atlantic region in the south, then successively reaches points more and more towards the north.

This conflict of polar and equatorial winds, opposite in character and direction, gives to our climate one of its most characteristic features, that changeableness, that extreme variety of temperature, of dryness, and of moisture, of fair weather and of foul; that uncertainty of the seasons which always keeps the merchant and the farmer in anxious suspense, between the hope of a good harvest and the fear of a dearth.

Not only are the variations in the same year considerable, but they are still more so from one year to another. The system of these currents oscillates from east to

d changes place. The polar winds will prevail
ıtry, and will endanger the crops by the pro-
ryness of their atmosphere; while further east
he tra will spread fertility by its benefi-
.s. (osite: the south winds acquire
:por that the harvests perish by the
. whil newhat greater distance, on the
he nature lavishes all her treasures
l has been remarked that a mild

winter in Europe corresponds frequently to a severe winter in America and Asia; while the mildness of the winter in America affords a presumption of a colder winter on the other side of the Atlantic. The years 1816 and 1817 were marked, as is known, in the history of Europe, by a general famine and distress. The wet was such that the harvests failed entirely. But the south-west wind, which blew without cessation over the western part of the continent, and drenched it in its vapors, did not extend beyond Poland; and it was the South of Russia whose corn supported famished Europe for many long months. Then was revealed the commercial importance of these countries, hitherto unknown, and constantly increasing since. Who does not still remember the immense impulse given to the commerce between Europe and America, by the drought of 1846, which damaged the corn crop in Europe, while America had an abundant harvest! These examples show us the important part played in the [illegible] by those variations of the atmospheric [illegible] our temperate countries.

[illegible] of the northern hemisphere, [illegible] only two normal winds, [illegible] that of the south-west. The [illegible]ons, are local winds, or [illegible]neral currents to the [illegible] that, in Europe at [illegible]er in an order always [illegible] the law of rotation of [illegible] understood if we [illegible]ing their course, the

south-west wind tends always to become more west, and the north-east more and more east; we shall see that the result of this disposition ought to be, wherever they meet each other and change places, a rotation from west by north to east, and from east by south to west. In the place of the conflict of the two currents, the wind will then blow successively from these different regions, and in this order, until it is established in the direction of that one of the currents which has overpowered the other. But no one of these transition winds blows for any great length of time. In the southern hemisphere the order of succession is the reverse.

The course of the winds being explained, it will be easy to understand the distribution of the rains on the surface of the globe.

The winds sweep in all directions, as we have just seen; they carry with them into the places where they go, the temperature and the moisture of the places whence they come. A sea breeze will be always moist relatively temperate; a land wind, dry and extreme, er in cold or in heat. The first, ordinarily, is the l of rain; the second, fair weather. It is the where that brings into connection the most dis- globe, with regard to temperature ftens all the differences by blending characters. w the atmosphere is charged with ean, but we have not stated how it vapors are condensed anew, to fall

again in rain. This depends chiefly on a property of the air, of which we must say a word.

A determinate volume of air, a cubic foot, for example, at a given temperature, has the property of receiving a certain quantity of vapor, of water in an invisible state, or, as we call it, *humidity*. When it contains all the humidity it is capable of receiving, it is said to be *saturated*. If you increase the temperature, it will be able to hold more; if, on the contrary, you lower the temperature, you diminish its capacity for vapor, and, in the given case, a part of the vapor would be condensed and deposited in small drops of rain along the outside of the vessel. The moist air here is like a sponge filled with water; reduce its volume by pressure, there will run out a certain quantity of water; in the air laden with moisture the diminution of the temperature takes the place of pressure.

We can easily conceive the application of this principle in meteorology.

A warm and moist wind, the south-west of the Atlantic, for example, setting from the tropics, comes in [illegible] air of the temperate regions; its [illegible] can no longer contain as [illegible] A portion of its humidity [illegible] clouds, then falls in rain. [illegible] with clouds arrives [illegible]r example, from [illegible] the case during [illegible] air of the desert, [illegible] vapor, dissipates [illegible] up, vanish, and

disappoint the excited expectation of the traveller, who hoped for refreshing rains.

Do the moist winds encounter an elevated obstacle, a high chain of mountains, a plateau? Forced to ascend their slopes, high into the atmosphere, they find there a colder air, which condenses their vapors, and the rain flows down along the sides. The wind passes over to the other side of the chain; it arrives dry and cold, deprived of all its moisture, without clouds. The same wind thus brings rain on one side, and fair weather on the other. This is what happens every day on the two sides of the Scandinavian mountains.

It is even possible that an ascending current, if very violent, may hurry the abundant vapors of the lower layers to the more elevated layers of the atmosphere. The vapors are afterwards condensed there, and fall back in torrents of rain. Such at least is the explanation Humboldt gives of the rains of the tropics.

Aided by these preliminary remarks, we are enabled to account for the general phenomena regarding the distribution of rains, which I desire to explain to you. We will therefore devote the remainder of our time this

ring out the general march of this

e tropical regions and the temperate

winds, and the rain, having an

th the others, and playing

and effect, the earth, in the

nsideration, is divided, as in

erature and winds, into two

of periodical rains, or of the

...torial regions: —the other, that of continuous rains, or ...f the temperate regions.

In the equatorial regions, where the course of temperatures and winds is regular, that of the rains is equally so: and instead of seasons of temperature, which are here unknown, the inhabitants draw the distinguishing line between the dry and the rainy season.

Wherever the trade wind blows with its wonted regularity, the sky preserves a constant serenity, and a deep azure tint. ...serenity when the sun is in the opposite hemisphere. The air is dry, and the atmosphere cloudless. But a little before the sun approaches the zenith, the trade wind grows irregular, the sky assumes a whitish tint, it becomes overcast, clouds appear, sudden showers, accompanied with hail storms, ensue. They occur more and more frequently, and turn at length into floods of rain, inundating the earth with torrents of water. The air is at this time so damp that the inhabitants are in an incessant vapor bath. The heat is heavy and stifling, the body becomes dull and enervated; this is the period of those endemical fevers that destroy so great a number of the settlers who have come from the temperate zones. But ... s on a new freshness and vigour: the des... ...imated, and is overspread for... ...ting verdure, which ... animals. Nevertheless, ...ogress, advances to... ...places; the rains ... ...re serene, the ... heaven shuts ... ...g season.

Such is the normal course of the tropical rains. They fall everywhere during the passage of the sun through the zenith. The heat is then so violent that the ascending current neutralizes the horizontal trade wind. It hurries the vapors to the heights of the atmosphere, and the upper limit of the trade wind, where they are condensed and fall back in a deluge of rain. Now, as the sun passes and repasses from one tropic to the other, it follows that there is, in most intermediate places, a two-fold rainy season, the two periods of rain being more or less closely connected in point of time.

In India the course of the rain is not so regular; it depends entirely on the monsoons. The western coast of Deccan, the coast of Malabar, has the season of the rains during the monsoon of the south-west, which brings thither the vapors of the ocean; that is, during the northern summer. It has the dry season during the monsoon of the north-east. During the winter, the mon[illegible] of the south-west ascends the slopes of the western [illegible], and causes, in the heights, violent storms and [illegible] abundant rains. Along the coast of Coromandel, [illegible] contrary, it is the north-east monsoon which conducts the rains, with the vapors of the Sea of Bengal,

[illegible] soon brings the dryness. These
[illegible] nsula have then their seasons
[illegible] dry weather when the other has

[illegible] The table land of Deccan par-
[illegible] the tw[illegible] eters; t[illegible]ll of water is more
[illegible]le, and t[illegible] often t[illegible] eriods of abundant

We see here that the relative position of the lands and the seas regulates the seasons.

The quantity of water that falls from the atmosphere in the tropical regions during some months is enormous, if we compare it with that which we are accustomed to see within the soil of our own countries. It has been admitted, that, on the average, there fall annually in the valley of the Mississippi 40 inches of water, and 115 in South America. The mean for the equatorial region [illegible] of meters.

As the annual quantity of rain received in some localities may under the influence of certain circumstances, is [illegible] much more considerable. At Paramaribo, in [illegible] it rises to the amount of 229 inches of [illegible] At St. Louis de Maranhao, in Brazil, [illegible] have been received, or 23 feet. But the [illegible] ever observed is that of Mahabaleshwar, [illegible] south of Bombay, at the height [illegible] it rises to the enormous number of 302 [illegible] A layer of 25 feet of water would have been [illegible] if they had not gradually

[illegible] more astonishing, as all thi[illegible] a few months, and, [illegible] to fall at Caye[illegible] is nearly as mu[illegible] the northern lat[illegible] ding the ab[illegible] is mu[illegible] ven ? [illegible] nearly

and many days pass without a single drop of water falling from the atmosphere.

We may conceive the prodigious effect such violent showers must produce upon the rivers. Who does not now understand the secret of the overflowings of the Nile, once so mysterious, which are due to the circumstance that the region of its sources receives the tropical rains?

Floods of forty feet rise and upwards are frequent at this season in the great rivers of South America; the llanos of the Orinoco are changed into an inland sea. The Amazon inundates to a vast distance the plains it flows through. The Paraguay forms lagoons, which, like those of Xarayes, are more than three hundred miles in length, and ooze away during the dry season.

The quantity of water contained in the tropical atmosphere in the condition of transparent gas, is always considerable. It is in proportion to the heat, which, being always very great, augments its capacity to a very high degree. Even under the most serene sky, the air is still abundantly provided with it. It is this invisible vapour which, being absorbed by the plants, and taken [illegible] their [illegible] leaves, produces the vigorous vegetation and verdure that fills us with astonishment. A void of rain, and cloudless [illegible] year; while in our climates, [illegible] a few weeks only, we see all [illegible] flowers perish for the lack [illegible]

[illegible] temperate regions [illegible] to the tropics. Here,

[illegible]

[illegible] cause produces frequent [illegible] at the solstice, or summer rains, [illegible] the greatest point attained by the trade wind [illegible] at the greatest declination of the sun [illegible] this month.

[illegible] that it must be admitted that the general character [illegible] of those regions, their periods, and their [illegible] appear essentially to depend on a thousand [illegible] which influence them greatly.

[illegible] held by the atmosphere of the [illegible] that in the air [illegible] cannot endure [illegible] as I have

observed, and the quantity of rain water falling in them is also greatly inferior.

The mean is 34 inches in the Old World, and 39 in temperate America, or 35 for the whole zone. There are causes, however, to be pointed out hereafter, which produce the fall of twice and even thrice that quantity at certain points. The number of fair days is also far smaller. But if these fruitful showers are not granted to us with the same prodigality as in the tropical regions, they are, at least, better distributed throughout the year, in a manner more equal, more economical, and more advantageous to vegetation and the requirements of all organized beings.

LECTURE VII.

Modifications of the general laws of distribution of the rains — Decrease of the quantity of rain waters and of rainy days, from the seaboard towards the inlands — Numerous exceptions and their causes — Influence of the mountains and the table lands in the two worlds — Distribution of rain in South America; in North America; in Africa; in Europe; in Asia; in Australia — Special hygrometrical character of each continent — Difference between the Old and the New World, corresponding to the nature of their relief — Mixture of the continental and the oceanic element — Influence on organized beings — Superiority of the zone of contact, or the maritime zone.

Ladies and Gentlemen: —

The investigation we attempted to make in the last lecture, has convinced us of the intimate connection existing between the temperatures and the winds, and between both and the distribution of rain over the surface of the earth. In this last point of view we have recognized the existence of a zone of *periodical* rains, corresponding [illegible] regions of the equator, where the [illegible] and within the tropics, of *continuous* rains. [illegible] old regions, in [illegible] are more uniformly distributed over the course of the year. [illegible] [illegible] [illegible]

general winds which are the dispensers of the rain waters.

The map before us, on which it has been attempted to express, by deeper or lighter tints, the relative abundance of the rain that falls in each region of the globe, indicates these zones in a very clear manner; it will serve further to illustrate what remains to be said on this subject. (See plate IV.)

The winds of the ocean striking the coasts of the continents, and moistening them with their waters, penetrate equally into the interior, transport thither the vapors with which they are charged, and spread life and freshness on their path. But in proportion as they advance on their continental journey, they become more and more scant and sparing of these beneficent waters; their provision is exhausted, and if the way is too long, if the continent is too extended, they arrive at its centre, as arid and parched as a land wind.

This first result appears so natural, that it seems almost useless to exhibit it by figures. Nevertheless, we will let direct observation speak, that the fact may not rest upon assertion alone. Here is the quantity of rain water annually [illegible] the different parts of the same continent more or [illegible] remote from the seaboard. I add [illegible] the number [illegible] rainy days, to complete these observations. As [illegible] possible, I choose countries situated under similar [illegible] order to render them capable of a more [illegible] in this point of view; for, otherwise, [illegible] rain water diminishing in proportion [illegible] the torrid regions of the equator, [illegible] attribute incorrectly to the

[illegible] the area [illegible] the [illegible]

The mean [illegible] of the [illegible] [illegible] and the number of [illegible] are as follows in the [illegible] [illegible] [illegible]

tion of the rains more uniform in this part of the continent. Nevertheless, the following numbers seem to indicate that the influence of the continental position is not annihilated.

The annual quantity of rain water between 41° and 43° north lat. is, at

	Depth of Rain in inches.
Cambridge, Mass., ...	38
Western Reserve College, Ohio, ...	36
Fort Crawford, Wisconsin, ...	30

Again, between lat. 38° and 40° north.

	Depth of Rain in inches.
Philadelphia, Pa., and Lambertville, N. J., . .	45
Marietta, Ohio, ...	41
St. Louis, Missouri, ...	32

We may say, then, that, in general, a country is the better watered, the nearer it is to the seaboard; and, from moist and verdant Ireland to the desert of Gobi, we find all possible gradations between the extremes of moisture and aridity.

This indubitable general law, however, undergoes
is modifications, which infinitely diversify the
f the climates in regard to their wetness or
causing the most surprising anomalies.
shore of the Caribbean Sea, on the coast of
, is situated the city of Cumana, which has
elebrated in the annals of science by the

no sooner passed the threshold of the desert, than the dry and burnt air, as we have already said, dissipates even the smallest cloud.

But it is not the same when the moist winds meet elevated objects, chains of mountains, and high table lands, in their transit. Forced to ascend along their sides, they are uplifted into the colder regions of the atmosphere; they feel the pressure of the air, which is less there, and the expansion of the gases composing them further increases the cooling; the air loses its capacity for holding the same quantity of vapors as before. The latter are condensed into clouds, which crown the summits of the mountains, and trail along their sides; and they melt soon into abundant rains. If the sea wind passes the chain, it descends on the opposite side, dry and cold; it has lost all its marine character.

The mountain chains are, then, the great condensers, placed by nature here and there along the continents, to rob the winds of their treasures, to serve as reservoirs for the rain waters, and to distribute them afterwards, as they are needed, over the surrounding plains. Their wet and cloudy summits seem to be untiringly occupied with this important work. From their sides flow numberless torrents and rivers, carrying in all directions wealth and life. Every system of mountains becomes the centre of a system of irrigation, of water courses, which gives to its neighborhood a value of primary importance.

This power of condensation is expressed by the fact, that in the heights of the mountains there falls more

almost the same phenomenon.
convexity of which is marked

by the curve of the Gulf of Genoa and the valley of the Arno. The summits, which rise from 4,000 to 6,000 feet, arrest the winds of the sea, and there fall at their southern foot 64 inches of water, while only 26 inches fall on the northern descent, in the plains south of the Po. The same relation exists further south, between the western and eastern slopes of the same chain; on the former it rains 35 inches of water; on the latter only 27.

We have already quoted Scandinavia as giving one of the most striking examples of this kind of phenomena. The elevation and the length of that chain, its lofty frozen table lands, which a long day's journey is hardly sufficient to cross, are an insurmountable barrier to the vapors brought thither on the Norwegian coast by the south-west wind from the Atlantic. They are condensed almost entirely upon the shores incessantly plunged in drizzling fogs. At Bergen, a day of sunshine is a rarity, in the midst of almost constant rains that darken the atmosphere. Thus we have there a fall of 82 inches of water, — an enormous quantity, especially for such high latitudes. All the western coast receives nearly as much, and owes to the temperature of this wind, and to the caloric disengaged by so active a condensation of vapors, the remarkably soft and equable climate which distinguishes it. On the southern coast, and in Sweden, there fall only 21 inches of water, and the same south-west wind brings thither clear weather and cold. The same wind carries rain on one side, and fair weather on the other.

In the East Indies, we encounter the majestic chain

[illegible] in the [illegible] plains of [illegible] peninsula, [illegible] [illegible] [illegible]

in plateaus so little elevated as Spain, whose central plains are from 2,000 to 2,500 feet above the sea. While the south-west coast of Portugal,— Lisbon for example, — is watered with 27 inches of rain, the border of the table land has only 11 inches; and soon, quitting the verdant region of the seaboard, we ascend the arid plains of Estramadura, of La Mancha, and of Castile, a the centre of which, Madrid receives not more than 1(inches of rain water. No other place in Europe is s badly provided in this respect. And, nevertheless, sid by side with this minimum of rain, we find the greate quantity that has ever been made out on this continer At the western foot of the Sierra d'Estrella, which a vances, like a spur, very far towards the coast, in valley of the Mondego, there has been received, i said, at Coimbra, the enormous quantity of 225 in(of water. An error has been suspected in this mea taken in 1816 and 1817. Schouw has reduced it t inches; Kæmtz, to 118; adopting the last number is still a difference of more than 100 inches from M situated under very nearly the same latitude, and same peninsula.

If it is so with the table lands of the third that of Spain, what will be the case with those masses which form the body of eastern an

e fringe of snowy mountains surroun distance from the oceans, the extent (their elevation in the atmosphere, conspire to give them that charact renders them almost an unbroken d(

[illegible] Mexico and [illegible] the [illegible] countries, [illegible] a [illegible] climate [illegible]. At [illegible] [illegible] [illegible] [illegible] of view; [illegible] [illegible] [illegible] the [illegible] the [illegible] [illegible] [illegible] [illegible] reduced.

[illegible] [illegible] [illegible] [

In South America, the principal body of which is situated under the sky of the tropics, this disposition secures to the continent a copious supply of moisture. The plains of the east are open to the trade wind of the Atlantic, which sweeps over them unobstructed, and bears thither unceasingly the vapors of the ocean. The secondary chains of Brazil and of the Guyanas, from 5,000 to 7,000, do not rise high enough into the atmosphere to arrest it; the only effect they have, is to augment the falling showers, and to supply a more complete irrigation. The Orinoco, and the lower tributaries of the Amazon, the Tocantins, the San Francisco, and many others which flow from these two systems, are there to tell us. But it is not the same with the Andes. This chain, whose crests and summits lift themselves everywhere into the region of perpetual snows, forms, by its elevation and continuity, an invincible obstacle to all the moist winds of the east. The vapors, having traversed the plateaus of Eastern Brazil, without lingering there long, accumulate and condense, and flow down their eastern slopes. All this zone at the foot of the Andes is one of the best watered in the globe. Thus we see issuing from hence those immense streams; the Marañon, the king of the rivers of the earth, and all its tributaries, the Ucayale, the Rio Purus, the Madera, and many others, to which nothing is wanting but to flow through civilized countries, in order to rival in importance the Nile, the Ganges, and the Mississippi.

But on the other side of the Andes all is changed. Neither the trade wind nor its vapors arrive at the

western coast. Scarcely do the table lands of Peru and of Bolivia receive from them the latter benefits, by the storms which burst out at the limit of the two atmospheres. The coast of the Pacific Ocean, from Punta Parina and Amatope to far beyond the tropic, from the equator to Chili, is scarcely ever refreshed by the rains of the ocean. Deprived of the vapors of the Atlantic by the chain of the Andes, these countries behold the vapors of the Pacific flitting away with the trade wind, and no accidental breeze brings them back. Drought and the desert are their portion, and on the border of the seas, in the very sight of the waves, they are reduced to envy the neighboring countries of the centre of the continent the gifts the ocean refuses to themselves, while lavishing them upon the others. Thus, under the same latitude, under the same tropical heavens, where the phenomena meantime are so regular, the two slopes of the Andes have a climate perfectly opposite. In one of them, the richest vegetation; in the other, drought, and a parched soil, the nakedness of which is poorly disguised by the light robe of a thinly scattered vegetation. The Andes separate the two [illegible] and testify strongly to [illegible] performed in climates by [illegible] situation relatively to

[illegible] this arid region [illegible] them as the [illegible] with the same [illegible] the coast [illegible]

besides that the depression of the Cordilleras towards the north allows the trade wind to round it and to reach the western side, let us remember that this part of the coast corresponds nearly to the zone of calms, in which the direct influence of the trade wind is nearly annihilated, and where almost daily rain storms bring back to the earth the vapors in the very places whence they have risen. The influence of this latter circumstance here neutralizes the action of the Andes.

It is not the same at the southern limit. Here, not only the chain is continuous, but it forms, in the lofty table lands of Southern Peru and of Bolivia, the broadest and the highest terrace of all the Andes, shutting out all communication between the two sides. Moreover, we are here upon the limit of the tropic, and the regions in the neighborhood are often scantily supplied with rains, as we shall by-and-by understand. The lower regular trade wind begins, in fact, to blow there, and, as we know, the sky remains everywhere serene. The upper, or return trade wind, does not yet fall there; so that the causes of the condensation of vapor are wanting, and dryness of climate is the inevitable consequence. It is only at a greater distance, where
l reaches the surface again, that the
s commences, and with it the rains.
Bolivia, at the south of the Gulf of
iences unite and cause an
e long desert of Atacama,
rly to Chili. It is only in
return trade wind of the

[illegible] itself felt that the rains recommence [illegible] to water the earth.

[illegible] part of South America situated beyond the [illegible] the relative position of the Andes and [illegible] on the east produces an opposite effect. [illegible] of the Pacific cannot penetrate there. The [illegible] north-west trade wind avoids the coast and [illegible] the Atlantic Ocean, or, driven aside by the [illegible] has arrived and made continental, [illegible] of Paraguay and of the Pampas. [illegible] the south-west wind in Buenos Ayres, called [illegible], which carries to the coast only the [illegible] it has raised in the arid plains it [illegible]. The western coast, on the [illegible], with the return trade wind of the [illegible] of the Pacific Ocean. Chili has [illegible] at the moment when the north-west [illegible] regions of the tropics. More [illegible] of the winds of the sea coming from these [illegible] and give all this southern [illegible] the enormous rains belonging to the [illegible] Tierra del Fuego and Cape [illegible] of all the sea winds, are [illegible] covered by the [illegible] very flattering [illegible], has been [illegible] travelled [illegible] tempests.

[illegible] plains

of the tropical portion and the comparative dryness of the temperate.

In North America, an analogous disposition of the reliefs, and of the atmospherical currents, would doubtless produce the same dryness as in the plains of La Plata and the Pampas, if the deep cut of the Gulf of Mexico did not open the whole south of the continent to the wet winds of the tropics. Instead of coming from the interior of the continent, as in the temperate regions of South America, the return trade wind, which enters by this broad gate, comes directly from the seas, and has lost nothing of its vapors. It waters copiously along its course the whole Atlantic region and the western slope of the Alleghanies; even the valley of the Mississippi shares its benefits, although to a less degree. Towards the north, in the interior, the polar winds seem to resume their empire, and the moisture lessens. Thus North America is more favored with rains than could be expected from its situation westward of the return winds of the equator, and from its character as a large continent.

Along the western shore, from the coasts of Mexico to [illegible]rth latitude, we find the same succession of [illegible]nerica, in latitudes nearly cor[illegible]e tropics, in the rear of the [illegible]o. where the trade wind of the [illegible]ht reigns, as on the coast [illegible]ion, where the south[illegible]e influence, the rains [illegible] the high table lands

of California. Oregon, as well as Chili, has the winter rains, indicating the return of the upper trade wind to land: they seem to penetrate even beyond the Rocky Mountains, east of which the winter rains are frequent. Here we find the sources of the Missouri. In the North, finally, in Russian America, where the coast bends in and forms a deep bay, the south-west winds strike the coast, and produce the continuous and copious rains, the temperate, equal climate, and the vegetation of the coasts of Scotland and Norway.

The investigation we have just made of the distribution of the rain in the two Americas shows the influence of the direction of the high chains, and of their position on the western coast. It is immense. Place the Andes along the Atlantic, and the marine trade wind is arrested and dried; the table lands of Brazil, the endless plains of the Amazon, are nothing but a desert: no more of that wealth of vegetation, of those virgin forests, which now constitute their beauty; South America loses its character.

Place the Rocky Mountains east of North America, open the plains of the Mississippi to the south-west w[illegible] the climate becomes softer, m[illegible] better watered, perhaps; [illegible] But what would then [illegible] the entire future of this [illegible] the desert table [illegible] mountain ranges, in [illegible] Atlantic coast? [illegible] relations with [illegible] from the civilized

nations, looked only towards the Pacific Ocean and China?

If we now direct our attention to the Old World, we shall again find the same influence of the forms of relief.

Tropical Africa, and the greatest part of the East of this continent, present two regions very unequally supplied with rains. On the north of the equator, the lands are less consolidated, the plateaus isolated from each other. Abyssinia is far from Mandara, and that is far from the Kong Mountains. The coast, from Cape Guardafui to that of Zanguebar, is slightly elevated; it permits the east winds of the Indian Ocean to penetrate the inland and to water all these parallels. The coasts of Senegambia and of Guinea are in the region of calms at the meeting of the two trade winds, and owe to this circumstance their copious rains, their climate, moist and fruitful, but treacherous and fatal to the man of the North.

On the south of the equator the plateaus are continuous; but instead of being in the West, as in America, the uplands are in the East; the eastern coast rises, and probably reaches, in the chain of Lupata, the

this part of the continent. Then the

ts the vapors; there the rains are

ıdant, from Cape Guardafui to Cape

elevated plains stretching

Congo, seem to exhibit, as

ility and drought under the

the plains of the Amazon

year by torrents of water.

The contrast is complete; and whence comes this difference, if not from the disposition of the reliefs in the two continents?

The region of Cape of Good Hope is watered on the south-east coast, during the summer, by the winds of the Indian Ocean. But in the whole West the climate is dry except at certain points, and the Atlantic sends it only a few autumnal and winter rains.

The North, finally, Sahara, is closed towards the east [illegible] access of the winds; its sub-tropical position [illegible] nature of its soil contribute further to cause the [illegible] of rain, making it one of the most vast and [illegible] deserts in the world.

[illegible] by the absence of [illegible] stands along its seaboards, is open to [illegible] winds of the Atlantic, which bring their [illegible] the year. The small extent of its [illegible] number of its inland seas, and of the deep [illegible] its mass and leaving no place very far [illegible] all these circumstances secure [illegible] and that comparative to it peculiarly. [illegible] ss diversity of [illegible] we have seen, [illegible] ions as manifold a [illegible] without a [illegible] anges [illegible] s the [illegible] lentiful

rains are reduced to a very small quantity on the plateaus of Deccan. All the region of Indo-China and of the great Asiatic archipelago is one of the best watered in the world. The conflict of the different winds, of which all this space is the theatre, the variety of the lands, so numerously scattered there, and the discontinuity of the chains, which can nowhere arrest the winds, are so many causes that secure to the whole of it such copiousness of tropical rains.

The Himalaya and the lofty chains of China stop the course of the ocean winds; all beyond, towards the interior, is a desert; it is the Gobi, the Tangout, and the sandy seas of Turkestan.

Australia is as yet so little known that it is impossible to analyze its climate. Nevertheless, what we have learned of late years concerning the configuration of its relief, proves that the highest lands, as in Africa, are placed on the eastern border of the continent. The trade wind of the Pacific scarcely penetrates thither, and that of the temperate regions shuns the coast. Furthermore, the southern half is, for the greater part, in the sub-tropical region, and seems to be deficient in mountains. Thus we may believe that the interior is a desert. But the eastern coast, Botany Bay, and the Australian Alps, are better watered than Swan River, on the western coast, and the prosperity of the colonies established on these two shores, has, of necessity, been in proportion. The mean quantity of rain water which falls in this part of the world is estimated at twenty-five inches; it is the most insular, and yet, owing to these circumstances, and to its rounded form, the most imper-

...ceeles lid
...er forms
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...ences are given by
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...ents, and the particular
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...ns, each con-
...North America is the
...continents: North America,
...temperate continents. But the
...Africa and Asia present
...the driest and most in the zone of
...the trades blowing from the regions bathed by the
...rains of the tropics: temperate Asia is the dryest of the
...northern continents. Europe combines the moisture of
...climate with a great variety of contrasts;
...all softened. Australia, finally, is the
...st of the continents.
...ew of
...efs in the two worlds thus
...New World is that of
...to the winds of the sea;
...ed up and massive; it is,
...The Old World is that
...ents; drought is its por-
...the influence these circum-

stances of humidity or aridity exercise on the vegetation, the aspect, and the organized beings of a country, to foresee that these great differences between one world and the other will be again reproduced in another province.

We have taken a rapid view of the variety of the phenomena to which the intermingling of the solid and liquid elements, of land and water, gives occasion. It would be easy, by a more detailed examination, to increase the number of these contrasts, of which I have pointed out only the most general. But I have said enough for a sketch of this vast subject, and to enable you to take a glance at all the wealth of life that nature unfolds by means so simple. I will add only one consideration more, which will serve for a conclusion to what we have thus far said of this great contrast of the continental and oceanic hemispheres.

We have seen, gentlemen, that it is from the combination of the two elements that life is born, a higher life than that belonging to either of them. It is neither the oceanic climate, nor the continental climate, which we shall proclaim as the foremost climate of the world; it is the combination of the two — it is the *maritime* limate. Here are allied the continental vigor and the ceanic soft[illegible] in a fortunate union, mutually temper-[illegible]g ea[illegible] Here the development is more intense, [illegible]fe m[illegible] re varied in all its forms. And when [illegible]o th[illegible] further add the advantage of a tropi-[illegible]al [illegible] he forms of nature are, as it were, [illegible]aise[illegible] ghest degree, and the wealth it brings

[illegible]

[illegible] the [illegible] and [illegible] complete, and [illegible] and [illegible] [illegible] and in that [illegible] [illegible] which fills the [illegible] [illegible] and [illegible] those of Deccan [illegible] [illegible] with [illegible] [illegible] [illegible] of plains and [illegible] [illegible] [illegible] and all [illegible] [illegible] [illegible] in the most [illegible] [illegible] the humid atmosphere of [illegible] [illegible] the burning rays of a vertical [illegible] [illegible] by means of physical life which [illegible] [illegible] and then what mighty, what [illegible] vegetation. We see in the same time plants with broad and numerous leaves, the excessive expansion of which is always the proof of an exuberant humidity, and those shrubs with concentrated and elaborated gums, those spices, those aromata, that [illegible] to the dry and intense heat of the conti- [illegible] the country of the mighty Banian, the [illegible] strength. There uplifts its head [illegible] palm a single leaf whereof, six- [illegible] and [illegible] round, is enough to give [illegible] once; and in the bosom [illegible] the largest flowers in the [illegible] gigantic corolla alone [illegible] foot across. There grow [illegible] pepper, and the cloves,

which all civilized nations have fetched thence from time immemorial.

Everything most grand and powerful of the productions of the animal world is there encountered. The rhinoceros, the huge royal tiger, the orang-outang, that great serious-looking ape, the most perfect of animals, and that which seems to foreshadow in its structure the complete configuration of the human body, are all inhabitants of those countries. If to these we add the mineral wealth, the gold and the diamonds, abounding there, we may pronounce these regions the most richly endowed of the universe.

But let us raise ourselves above the limits of the natural, into the regions of the historic world. Where have we beheld all peoples and societies arrive at their highest perfection, if not in Europe, that peninsular continent, the most indented and most maritime of all the continents? Where do we see barbarism reign triumphant, if not in Africa and Australia, continents shut off from all contact with the rest of the world, its seas and its people, by their continuous and unindented outlines? This is neither the time nor the place to analyze the causes of this phenomenon; I now merely allude to the facts, intending to return to the subject hereafter. But I will add, that it is not an isolated fact. Call t ır historical recollections, and cast your eyes ıap of the world, and you will see that all th ivilized peoples of the earth, with the excep or two primitive nations, have lived, or stil ıe margins of seas or oceans.

and the Hindoos unquestionably repre-

[illegible] civilization in [illegible] Phœnician Asia Minor [illegible] commercial the highly civilized [illegible] as the means [illegible] as well as for their connection [illegible] Mediterranean Sea. To come to a later [illegible] to the ocean that Spain and Portugal owe the [illegible] part they played at the period when superb [illegible] extent of the historic world. At [illegible] the might of England causes itself to be felt from one to the other extremity of the world.

[illegible] this new world of North America, now entering [illegible] great career among the nations under so [illegible] it not on the shores of the Atlantic [illegible] in its most active, most intense, [illegible] Is this merely a chance consequence [illegible] debarkation at that point of the [illegible] World? No, gentlemen, [illegible] the prospects the West may aspire to from the [illegible] life and action will always point towards the east which can only derive fresh accessions of prosperity from the prosperity of the interior. The [illegible] nations is in the commerce of the world, not only in a material, but even more in a moral point of view; and it is because America is [illegible] queen-like upon the two great oceans, that [illegible] be called to play a part as mediator between [illegible] the world, of which no one can [illegible] magnificent extent.

[illegible] of the contrast between

the continental and the oceanic world, as regards the intermixture of their natures. It is in this region of contact between the sea and the ocean that life is unfolded in its most intense and diversified form; and, both in point of nature and of history, the maritime zone of every continent enjoys a superiority over all others not to be questioned or disputed.

[redacted]

tion, by the forms of their coasts, and their submarine relief, it will be sufficient for our purpose to take cognizance of the principal phenomena presented by the marine currents, without entering upon details which the shortness of the time allowed compels me to pass over in silence.

The spectacle around us has accustomed us to see the continental waters in motion. We hear, without astonishment, the streams murmur in the meadows, the torrents roar in the mountains, and behold the rivers flow majestically along their bed. The cause of this motion of the water is familiar. We know that the particles of this movable element, influenced by the hidden power of gravitation, move and flow untiringly, until they have reached the lowest place accessible to them. If in their course they fall in with a basin having no exit, they gather there and put themselves into a state of equilibrium and repose, preserving their horizontal surface and their immobility, until driven from it by another force foreign to the first. Such are our peaceful lakes, with pure and tranquil waters, whose mirror reflects the mountains that adorn their margin, the azure of the sky, and even the slightest cloud floating in the atmosphere that bends over them.

But these basins, which here and there collect the living waters of the continents, are only the image, on a very small scale, of what the vast and deep basin of the oceans is for the whole of the waters of our planet.

All the water springs that furrow the continents tend towards this common reservoir. Gushing from the height of the table lands, or the lofty summits of the

[illegible] to fall [illegible] at a [illegible] plains [illegible] their [illegible] their waves [illegible] they were [illegible] their existence [illegible] of the [illegible] they disappear in the [illegible] whence they had issued.

We are, then, inclined to look upon the basin of the ocean as containing waters in a state of rest: for the cause which sets the river waters in motion exists no longer: the differences of level are annulled. Yet let us be cautious: all this may well be only a first appearance. The very mobility of water, which prevents it from reflecting permanent forms, and levels all inequalities, renders it also accessible to the slightest external influences, and several causes succeed in impressing upon this element, passive in the highest degree, the most varied motions.

The winds raise the waves of the ocean by an action wholly mechanical, and produce only a superficial and local agitation; but when they blow constantly in the same direction, they impart to the waters a transfer [illegible] in the direction of their own course. The sun [illegible] pass over the surface of the seas, and the [illegible] of waters, obedient to the mighty attraction, [illegible] up in a [illegible] swell, whose summit follows the [illegible] the d[illegible] minary. These are the tides. [illegible]ual p[illegible] atmosphere on the different

points of the ocean, whence result differences of level, and, above all, the differences of temperature between the tropical and the polar seas, to which correspond different degrees of density, are so many more causes disturbing the equilibrium of the oceanic waters, and creating in their bosom various motions which continually tend to reëstablish the equilibrium, but without effecting it. Sometimes the superficial mass is transported from east to west, as in the great equatorial current; sometimes a deep and narrow band, a true oceanic river, flowing rapidly through waters comparatively tranquil, as the Gulf Stream. Here the currents meet and unite; there they are superposed, and the upper and under currents run in opposite directions. Everywhere is agitation; nowhere absolute rest, as unknown to nature here as in all other quarters.

The greater part of the causes, to say nothing of others more doubtful which it would be useless to mention here, often act in concert to produce marine currents; but it would be difficult to assign to each of them the exact portion of effect belonging to it. There is one, however, which seems to control all the rest by its power and the constancy of its action, direct or indirect, and that is the difference of temperature between the regions near the equator and those in the neighborhood of the poles. Now, since the general winds, as we have seen, owe their origin to this same cause, we shall not be surprised to find a similarity, and, in some cases, a remarkable coincidence, between the march of the great atmospheric currents and that of the general currents of the ocean. For, not only do the

whence they had their being, accomplish every spring long pilgrimages towards the warmer regions, and stray even as far as the 40° of latitude. Like the atmospheric currents setting from these same quarters, they occupy the lower part of the domain of the oceans, while the warm waters of the equator spread over their surface. Hence the astonishing spectacle of those majestic icebergs, of which only an eighth part is visible, while the rest is sunk in the depths of the sea, continuing their solemn progress southward, and, on meeting the Gulf Stream, moving on in a direction opposite to the course of its waters, proving thus that the waters enveloping their bases pursue without obstruction their southward course. The polar currents, while advancing towards the equatorial regions, gradually make a bend westward, like the winds, under the influence of the earth's rotation, and at the meeting in the tropics are transformed into a vast movement from east to west. Add to this general tendency of the deep waters, the direct and constant action of the trade winds upon their surface, and that of the tides acting in the same direction, and the cause of this phenomenon will appear to you, if not fully explained, at least sufficiently accounted for.

The grand equatorial current is still more disturbed than the trade winds, by the continents arresting their progress and causing the waters to flow back in very different and often opposite directions to their original course. Each of the three great oceans forming a separate basin, and presenting a collective combination of physical circumstances which modify the march of

the oceanic currents in a peculiar manner, we proceed to pass them in review successively, beginning with the Pacific Ocean, whose system is more simple than that of the two others. (See plate I.)

The Pacific Ocean, owing to its vast extent, gives full and unimpeded sweep to the general currents in a more regular manner than either of the others. The Antarctic polar current, bent eastward by the prevailing winds of these regions, strikes the western coast of America between 50° and 40° south latitude. It divides into two branches, of which one runs southward, doubles Cape Horn, and carries its waters on to the Atlantic. The second and principal passes along the coast of Chili and Peru, cooling the climate by the low temperature of the waters it bears, which are from 10° to 12° Centigrade, or from 18° to 22° Fahrenheit colder than the neighboring sea off Lima. The current, to which it has been proposed, on good grounds, to give the name of Humboldt,—who was the first to prove its origin and abnormal temperature,—suddenly quits the coast near the height of Punta Parina, and goes on to form the grand equatorial current.

This latter occupies a breadth of nearly 50 degrees on the two sides of the equator, and passes beyond the tropics, north and south. It follows its peaceful and majestic course, unobstructed, with an average speed of from 30 to 35 miles a day, to the chain of islands that fringe the continents of Asia and Australia. On the north it reaches Formosa, and, running upon the coast of China, turns off and moves to the north-east along the shores of Japan. On the south, it is already

disturbed by the monsoons, and loses its way in the labyrinthine mazes of the grand Asiatic archipelago, whose seas heave with the violent currents that add further to the dangers of navigation in these stormy seas.

In the northern part of this ocean, the west winds reigning there determine a drift current, which advances to the American coasts and conducts the waters southward along the shores of California, whence they doubtless reënter the equatorial current, to commence a new circuit.

The polar currents seem to be almost nothing. The bank or neck, which in all probability unites the neighboring points of the continents of Asia and America under the waters of Behring's Strait, hinders the under currents coming from the pole from entering this basin, while the warmer waters of the Pacific flow on the surface into the Frozen Ocean.

In the Indian Ocean, the equatorial current, like the trade wind, is broken. In the region of the monsoons, or the northern region, the currents follow alternately the direction of these periodical winds, and flow with them six months in one direction, and six months in another. But in the south, where the trade wind retains its empire, the normal current holds its way, narrows as it approaches Madagascar, sweeps north of that island, and, stemmed by the coast of Africa, enters the channel of Mozambique.

Compressed into this narrow passage, it acquires the enormous speed of four or five miles an hour, and, reinforced south of Madagascar by another branch, reaches

[illegible] Cape Horn, [illegible] miles. [illegible] Having passed the coasts of America at Cape Horn, [illegible] miles, we reach the rising south-[illegible] along the coasts of Brazil and together with the [illegible] of the southern [illegible] resumes the route of the [illegible] and the Indian [illegible] Ocean. The other and principal [illegible] with [illegible] a [illegible] northwest direction, rolls its waters

along the shores of Guyana, enters the Caribbean Sea, which Rennel calls a sea in motion, rather than a current, penetrates into the Gulf of Mexico, making its circuit, and, passing before the mouths of the Mississippi, arrives at the narrow passage between the point of Florida and the Island of Cuba, whence it comes forth under another name.

In truth, the accumulated and moving waters of the Caribbean Sea and the Gulf of Mexico are the inexhaustible source of that torrent of warm water, which, under the name of the Gulf Stream, precipitates itself over the breakers of Bahama, flows along the coast of Florida, at a rate varying from two to five miles an hour, according to the season, and keeps on its way, upon a line parallel to the shore at a short distance from its margin, until it passes beyond Cape Hatteras. The Stream, hitherto narrow, deep, and rapid, meets in this vicinity the cold waters from the north, and the sand banks running along at a distance from the coasts as far as the southern part of Newfoundland. Repulsed by these obstacles, it makes a sudden turn to the east, becomes much broader, spreads over the surface, and holds henceforth its slackened course to the Azores, whence it bends towards the south, in order to recommence from the coasts of Africa the immense cycle of its never-ending rotation.

These warm waters of the tropics advance northward even beyond the limits we have just indicated. Driven by the south-east winds prevailing in the northern Atlantic, they proceed to bathe the coasts of the North of Europe, the temperature of which they soften, and often

upon the subject, we

know already enough, I believe, to be convinced that, if the causes of these movements flow, for the most part, from the general laws regulating the physical constitution of the globe, their evolutions, and the special and individual characters they assume in each ocean, are an immediate result of the configuration and disposition of the terrestrial masses forming the basin of the seas.

The great oceanic currents are one of the grandest phenomena presented by the wise economy of nature. Their extent, the prodigious length of their course, in some nearly equal to the circumference of the globe, fill us with astonishment, and leave far behind everything of this description to be seen in the water courses of the continents. Owing to these permanent streams, the sea waters mingle from pole to pole, and move with sleepless flow from the Pacific to the Indian Ocean, and from this to the Atlantic; and this unending agitation preserves their healthfulness and purity.

Like the winds, the currents tend to equalize differences, to soften extremes. The cold waters of the Antarctic pole temper the scorching heats of the coast of Peru; the warm waters of the Gulf Stream lessen the severity of the climate of Norway and the British islands. Their importance is no less in the relations of the people and the commerce of the nations. It is the currents which, together with the winds, trace the great lines of communication upon the highways of the oceans, favoring or obstructing the intercourse of one country with another, bringing near together places apparently the most remote, separating others that seem to touch

[illegible]

[illegible]

[illegible]

their very nature, destined not to live isolated, but to form together a single organism, a grand harmony.

During the whole of this study, please to remember, gentlemen, we are in the realm of nature, and not in that of history. The America we are seeking to understand is that which Columbus and his successors discovered, still entirely a virgin world, centuries ago; and not the New World of history, we shall have to speak of later, that has come to plant itself on that soil.

A general comparison of the two groups of continents will call to mind some of the leading features we have already become acquainted with, and add some others.

The Old World and the New World differ in the groupings, and in the number and extent of the continents composing them; in their astronomical situation, with respect to the climatic zones; in the general direction of their lands; in their interior structure. This assemblage of opposite characters secures to each of them a climate, a vegetation, and an animal kingdom, peculiarly their own.

I say, first, in their groupings: —

The Old World is composed of four continents. Setting aside Australia, which is only an island in the midst of the oceanic hemisphere, it numbers three, all very near each other, aggregated, and forming an oval, compact m[illegible], whose extent far surpasses that of every other [illegible]al space. It presents a solid extent of land, the [illegible]t, the most unbroken, the least accessible in its [illegible] the influences of the Ocean. The Old World [illegible]ently the *continental* world.

[illegible] World has only two continents, North Amer-

[illegible] America as [illegible] would [illegible] them — under [illegible] were not [illegible] same. These two continents are not [illegible] mass, nor [illegible] but [illegible] with [illegible] their [illegible] and [illegible] their [illegible] and [illegible] their [illegible] and

In the New World the lands are distributed in a manner nearly equal in the two zones and in the two hemispheres. We find that the countries it includes, those the most richly endowed, are situated under the sun of the tropics. Compared with the Old World, the New World is thus essentially *tropical.*

The general direction of the lands, or the direction in which their length extends, is the inverse in the two worlds. The Old World has its greatest prolongation from east to west, in the line of the parallels; the New World from north to south, in the direction of the meridians. Both have a length of about 7,500 miles, but the breadth of the Old World is nearly double that of the New. This disposition is of the greater consequence for the distribution of the climates in each of them, since this configuration coincides, as we have seen, with the interior structure, with the direction of the principal mountain chains, and of the table lands. From one end to the other of the Old World, over a space of several thousand miles, the migratory tribes are able to pursue their adventurous roaming course by following, according to their custom, the great features of relief of the soil, without witnessing any change in the vegetation or the animals that surround them. They change place but not climate, nor ways of life. This similarity of climates over long spaces is, then, a property of the Old World, and must have singularly favored the dispersion of the primitive tribes.

In the New World, on the contrary, the zones of similar climates are short and numerous; and if we trave over the whole length of the two Americas, we

... ... temperatures. ... ...

long cord of the Rocky Mountains and of the Andes, running the length of the extreme western coast, and binding the two continents together; great plains on the east, forming the larger part of their surface; a slightly elevated chain along the Atlantic coast of both, the Alleghanies in North America, the Serra do Espinhaço and the Serra do Mar of Brazil, in South America; finally, in the centre, three short, transverse chains, that of Parime in the Guyanas, that of Venezuela, and that of the great Antilles, broken into a number of islands;—these, in few words, are all the essential features of this vast division of the world.

That which constitutes the richness of organization the continents, is the number and abundance of inter contrasts calling out at once the activity of nature that of man. The Old World is full of them; Am has only a small number, all tending to disapp reason of the structure itself.

Thus, in Asia and Europe, the line of the lands, the continental axis, extending from alaya to the Alps and the Pyrenees, divides continents into two unequal parts, one no south, opposite in climate, in vegetation, races. Scarcely anywhere is the transitio the other gradual; almost everywhere i sudden. The table lands of Tubet and touch the tropical plains of China and traveller who passes the Alps, abandon scapes and the firs of the North, to de day's journey, into the ever verdant range groves of fair Italy; he excha

[redacted]

undoubtedly owe the appearance, at the North, of plants and animals that seem to belong only to the tropical regions. Not without surprise, the European, landing on these shores, sees the humming-bird, that diamond of the tropics, glancing in the sun in a country which winter clothes, during long months, in a thick mantle of snow and ice.

It is the same towards the South, where we see the palm trees and the parrots of the tropics, here and there, as far as the Pampas of Buenos Ayres, much beyond their natural limits.

Thus the contrast between the North and the South is softened, reduced; but it is not annihilated; it exists on a great scale from one of the continents to the other; for North America is temperate, and South America is tropical.

America is cut by the Andes into two parts, East and West, as Asia and Europe are cut into two parts, North and South. But this contrast likewise is almost neutralized, as we shall soon understand.

The inequality is here carried to the extreme, to such a reduction of one of the parts, that it loses its importance, and, so to speak, its power of reaction. The western coast, dry and barren, has not extent and influence enough to enter upon an effective rivalry with the vast countries of the East. Moreover, the difficulty of communication renders the mutual action and the intercourse between the countries situated at the foot of the two inclinations, still more rare. Finally, the two sides of the Andes, being under the same latitudes, have the same, or nearly the same, climate, and differ merely

[illegible]

The temperate regions of Europe have 34 inches; North America, 39 inches.

Add to this abundance of water, the extent of plains permitting the development of vast systems of water courses, and you will understand the existence of that innumerable multitude of rivers and lakes, which are one of the most characteristic features of the two Americas. Notwithstanding a much smaller extent than that of the Old World, the New possesses the largest rivers on the earth; the richest in waters, those whose basins occupy the broadest areas. Where can we find, on the surface of the globe, a river equal to the mighty Marañon, that giant among the rivers of the earth, gathering its waters from a surface of a million and a half square miles, and bearing them to the ocean, after a course of 3,000 miles? This mighty monarch receives in his progress the homage of tributaries, each of which, by its greatness and the abundance of its waters, would suffice for the wants of a whole vast country. Such are the Ucayale, the Rio Purus, the Rio Negro, above all the Madera, rivalling in importance the river to which it yields the honor of giving a name to their united waters. The further it advances in its majestic course, the more its proportions increase; and before arriving at the ocean, its broad sheet, from the middle of which the eye cannot reach the banks, seems rather to be a fresh-water sea, flowing sluggishly towards the ocean basin, than a river of the continent. Far from its mouth, the fresh and muddy waters of the Amazon are still distinguished at a glance of the eye from the saline and limpid waves of the

ocean; and the slime, borne along by their currents, goes to form, further north, a new soil on the shores of the continent.

In the other continent, the Father of Waters, the mighty Mississippi, the second of the rivers of the earth, equals in length the Marañon itself; for its winding course is 3,160 miles. But its basin covers only from [illegible] square miles. Who does not know the importance of tributaries like the Missouri, which wrongly gives up its name for that of its less powerful brother, like the Ohio, the Beautiful River, the stream with transparent waters; like the Arkansas, and so many others composing that vast system of arteries that water the whole West, and are destined to assume daily a greater and greater importance? And these immense rivers are not isolated. At the side of the Marañon, the La Plata has a course of not less than 3,000 miles, and more than a million of square miles; and many other rivers. At the side of the Mississippi, the St. Lawrence has a course of 1,200 miles, and a basin of nearly a million of square

[illegible] West, often making summer. The great- [illegible] rivers the Yang-tse-kiang in China has a [illegible] miles. The Ganges and the [illegible] The Volga, the great- [illegible] has a course of only [illegible] [illegible] Rhine, so celebrated, it [illegible] that we should have

And what shall we say of the abundance of its lakes? The group of the great lakes of Canada, so characteristic of North America, nowhere finds a parallel. It contains at once the largest lakes in the world, and the greatest mass of fresh water united on the surface of the continents. These vast fresh water seas, together with the St. Lawrence, cover a surface of nearly 100,000 square miles, and it has been calculated that they contain almost one half of all the fresh waters on the surface of our planet. They, too, are not alone, and a glance of the eye at the map enables us to perceive in the North a multitude of lakes but little inferior in extent: the lake Athapescow, Winnipeg, Slave Lake, the Great Bear, are worthy to figure side by side with the lakes of Canada and of the St. Lawrence.

The rivers and the lakes are the wealth, and justly form the boast, of America. No continent possesses so great a number, or those of such large extent, so well supplied with water, so navigable. Not only do they fertilize the rich countries they traverse, but they are now, and will become still more so, the great highways of commerce between all the parts of this vast world; we already see enough to hope everything of

ıre.

, gentlemen, the watery element reigns in the ›rld; add to this, that half of its lands are to the rays of the tropical sun, but that, all the being equal, America is, on the whole, a little than the Old World, and we shall have the atures of its climate. The oceanic climate—

this is what America owes to the fundamental forms and the relative disposition of its lands; while the Old World is indebted to it for the preponderance of the dry and continental climate.

Let us now follow out the consequences of these physical circumstances upon the development of organic beings, and the character of the New World will come out in all its clearness.

The warm and the moist—these are the most favorable conditions for the production of an exuberant vegetation. Now, the vegetable covering is nowhere so general, the vegetation so predominant, as in the two Americas. Behold, under the same parallel, where Africa presents only parched table lands, those boundless virgin forests of the basin of the Amazon, those selvas, almost unbroken, over a length of more than 1,500 miles, forming the most gigantic wilderness of this kind that exists in any continent. And what vigor, what luxuriance of vegetation! The palm trees, with their slender forms, calling to mind that of America itself, boldly uplift their heads 150 or 200 feet above the ground, and domineer over all the other trees of these wilds, by their height, by their number, and by the majesty of their foliage. Innumerable shrubs and trees of smaller height fill up the space that separates

s; climbing plants, woody-stemmed twining
itely varied, surround them both with their
inches, display their own flowers upon the
l comb in a solid mass of vegetation,
ole the axe alone can break
with bosom of their peaceful

waters swims the Victoria, the elegant rival of the Rafflesia, that odorous and gigantic water lily, whose white and rosy corolla, fifteen inches in diameter, rises with dazzling brilliancy from the midst of a train of immense leaves, softly spread upon the waves, a single one covering a space of six feet in width. The rivers rolling their tranquil waters under verdurous domes, in the bosom of these boundless wilds, are the only paths nature has opened to the scattered inhabitants of these rich solitudes. Elsewhere, in Mexico and Yucatan, an invading vegetation permits not even the works of man to endure; and the monuments of a civilization comparatively ancient, which the antiquary goes to investigate with care, are soon changed into a mountain of verdure, or demolished, stone after stone, by the plants piercing into their chinks, vigorously pushing aside, and breaking with irresistible force, all the obstacles that oppose their rapid growth.

South America, and particularly the basin of the Amazon, is the true kingdom of the palm trees; nowhere does this noble form of vegetation show itself under a greater number of species. This is a sign of the preponderating development of leaves over every other part of the vegetable growth; of that expansion of foliage, of that *leafiness*, peculiar to warm and moist climates. America has no plants with slender, shrunken leaves, like those of Africa and New Holland. The Ericas, or heather, so common, so varied, so characteristic of the flora of the Cape of Good Hope, is a form unknown to the New World. There is nothing resembling those Metrosideri of Africa, those dry Myr-

...les Eucalypti and willow-leaved acacias, whose ... shine with the liveliest colors, but their narrow ... turned edgewise to the vertical sun, casts no shadow. Everywhere, long and abundant leaves, an intense verdure, a strong and well-nurtured vegetation, these are what we find in tropical America.

North America, in spite of its more continental climate, shares no less in this character of the New World. The beauty and extent of the vast forests that cover its soil, the variety of the arborescent species composing them, the strong and lofty stature of the trees growing there, all these are too well known for me to stop to describe them. It is because this continent adds to a more abundant irrigation a soil slightly mountainous, almost everywhere fertile, securing to it always an equal moisture, a more abundant harvest of all the vegetables useful to man.

Not only is the vegetation abundant in the New World, but it is universal, and this is a further characteristic distinguishing it from the Old. We do not see ... those vast deserts so common in the other con... occupying a considerable portion of their ... deserts of California and that of Atacama ... and compared with those of Africa and ... for anything except to serve ... Orinoco, which their geo... ly to the fate of Sahara, ... the rainy season, and are ... arable vegetation. Life, ... almost extinguished, ... and more vigorous.

To the powdered sand, swept along by the winds, succeed rich pastures, where range a multitude of indigenous animals, mingled with herds of horses, and wild asses, coming from Europe; and thousands of reptiles, buried in the watery slime during the dry season, reappear, and fill again with life the temporary rivers and lakes with which these valleys are then overflowing. The pampas themselves are not without vegetation, and support at all times numerous herds. And who is ignorant that the endless prairies of the Mississippi and the Missouri produce every year an abundant vegetation, on which feed the bisons and the other wild tenants of the countries?

But what becomes of the animal in the peculiar kingdom of vegetation? Blessings are divided; all treasures belong not to one country alone. This luxuriant vegetation, it might be said, seems to stifle the higher life, in the animal world. Animal life is, as it were, overruled, enfeebled; it does not occupy here the first rank, which is its due; for it is dry heat, the continental element, that favors it.

From one end to the other of the animal scale, the families that seem to give to these countries their character, by the number of their species and by their

dance, are those connecting themselves,

of life, with the aqueous, or with the veg-

t.

ning is more splendid, more sparkling,

ct world in South America. The inex-

ety of their species, the brilliancy of their

of their bodies, make them one of the

most beautiful ornaments of these regions. Here live the Hercules beetle, the largest of the Coleoptera; and those brilliant broad-winged butterflies, the Menelaus, the Adonis, the Achilles, whose varying colors glitter in the sun like diamonds. But why be astonished? The existence of this little animal world is almost altogether dependent on the vegetation; the wealth of the one must create the wealth of the other.

Among the vertebrates, no family is so largely represented as that of the reptiles, for moisture is their element, and the rivers and temporary lagoons of the rainy season are peopled with Caimans, the crocodiles of the New World, the Iguanas, the most gigantic of the lizards, the Basilisks and other species, which multiply in the warm and sluggish waters. The forests harbor in great numbers those serpents of every form and [illegible] even to those monstrous boas, that are the terror of the natives themselves. They seem to be at home in this country.

But among the superior animals, development seems to be arrested, it is incomplete. The prevailing types are at the same time the inferior types. Among the birds, the soft plovers, inhabitants of the marshes and [illegible], of which the number of species far surpasses, perhaps, that of any other continent. In the mammalia [illegible] the Armadillos, the Pan[illegible], the Sloths, which characterize, [illegible], the fauna of South Amer[illegible] forests abound, but also in the [illegible] and representatives of the [illegible] less numerous in species

smaller in size; in a word, far inferior to the corresponding animals of the Old World; in the order of the Pachyderms, instead of the elephant, the rhinoceros, the hippopotamus, those giants of the Old World, the feeble and harmless tapir and the pecari; in the Ruminants, instead of the camel and the dromedary, the lama of the Andes, which reach only half their size; instead of the lordly lion of Africa, and the ferocious tiger of the islands of the Ganges, the ounce and the jaguars of the forests of Brazil, which are scarcely more than large cats. In the monkeys, finally, those with a prehensile tail, peculiar to America, are reckoned among the least perfect, the lowest of their order in the scale of organization.

Not only are the superior animals ill represented on this continent, but they have not the strength, nor the indomitable courage, not the ferocity, nor the intelligence of the similar creatures of the Old World. In all tropical America especially, as we see, the whole animal kingdom remains in an inferior condition. It is subjected to the watery element, and to the vegetable world; for in those regions where vegetable life is the superior, animal life stands but in the second degree.

North America, however, in consequence of her more continental character, possesses some superior types, which recall to mind, and perhaps equal, those of the Old World. The majestic bison, the deer, the elk, and the bear, give evidence of that same vigorous northern nature which predominates in the temperate continents, and of which, as we shall see, North America possesses her share.

Man himself, the indigenous man I mean, bears in his whole character the indelible stamp of this peculiarly vegetative nature. Living continually in the shadow of those virgin forests which overspread the land he inhabits, his whole nature has been modified thereby. The very copper hue of his complexion indicates that he lives more like the negro beneath the scorching sunbeams. His lymphatic temperament betrays the preponderance in his nature of the vegetative element. The Indian is of a melancholy, cold, and insensible race. "Foreign to our loves, our joys, our griefs," says a traveller, "it is rarely that a tear moistens his eyes, or that a smile lights up his features." The most barbarous tortures cannot extort from him a single complaint, and his stoical indifference is disturbed only by vengeance or jealousy. If he sometimes exhibits a display of prodigious muscular force, he is yet without endurance. Who knows not that when the first invaders of the New World endeavored to compel the inoffensive Indians, who had received them as gods, to the rude labors of the mines and the cultivation of the soil, those sons of the woods, incapable of [illegible] perished in agony by thousands? And [illegible] that the Europeans substituted for the [illegible] and vigorous nature of the Old World, [illegible] day, used as the instruments [illegible] tures, I had almost said, [illegible] that which destroyed the

[illegible] Indian tribes is tinctured, [illegible] powerful influence of his [illegible] Indian has continued the

man of the forest. He has seldom elevated himself above the condition of the hunter, the lowest grade on the scale of civilization. The exuberance of the soil has never been of value to him; for he asks not of the earth his nourishment. He has never even ascended to the rank of the pastoral man. With him no domestic animals are maintained to feed him with their milk, or clothe him with their fleeces, as they are by the nomadic races of the Old World. From one to the other extremity of America, we find the same lamentable spectacle; the people of the elevated table lands of Mexico and Peru are the only exception to this picture, and this exception goes far to establish the influence of the vegetative and humid nature of the lower plains of America. For if these nations do not exhibit the same character of inferiority; if they have raised themselves a little higher in the sphere of humanity, by the aid, perchance, of elements foreign to their own continent, it can be for no other cause than that, living in those heights, those aërial islands, above the influence of the hot and humid atmosphere, they have been removed from the potency of its action.

ger lemen, is the order, the admirable connection lien omena of nature with each other. The con- of the New World give to it a hot s impresses its own character on on. Man himself, the one being le to its influence, in proportion rtion of those superior faculties ed for the conquest and subjuga-

tion of that nature which was intended, not to govern, but to serve him.

We may rest, then, in this conclusion, that, as compared with the Old World, the New World is the humid side of our planet, the *oceanic*, *vegetative* world, the passive element awaiting the excitement of a livelier impulse from without. Such is the America of Nature, such was it before the arrival of the man of the Old World. We know already, and we shall see better yet hereafter, all that his superior intelligence has been enabled to effect in the way of improving upon nature.

LECTURE IX.

Geographical characteristics of the Old World — The continent of Asia-Europe — Comparison of its structure with that of America — The continental climate prevailing in the Old World — Consequences — Vegetation less abundant — Preponderance of the animal world — The Old World the country of the higher and historical races — Reciprocal action of the two worlds by means of man — Establishment of the man of the Old World in the New — Historical America compared with Europe — Alliance of the two worlds; solution of the contrast.

LADIES AND GENTLEMEN: —

The comparison we have made between the Old World and the New, and the detailed study of the first, have enabled us, I think, to determine its true character, the character assigned to it by its physical nature. The character it owes to its more oceanic position, to the abundance of the waters, to a more tropical situation, to a more fertile soil, is the marked preponderance of vegetable life over animal life. A vigorous vegetation, abundant rather than delicate, immense forests, a soil everywhere irrigated, everywhere productive—these are the wealth of America. Nature has given her all the raw materials with liberality; has lavished upon her all useful gifts.

...t our globe would be incomplete, gentlemen, if this ...ent were alone represented, if this were the only ...ld that existed. The comparative study we have ...menced has shown us already that this is not the

case; the group of continents combined in the eastern hemisphere has already appeared as possessing an assemblage of characters, securing to it an entirely different nature. One of the two worlds is by no means a repetition of the other; for the Author of all things is too rich in his conceptions ever to repeat himself in his works.

We know already a good number of the physical characteristics of the Old World, an unknown world to us no more. Nevertheless, it is well to recall them here, in order to group them in a single picture, and to deduce from them the essential and characteristic feature which distinguishes it from America.

The number of the continents, double that of the New World, their grouping in a more compact and solid mass, make it already and preëminently the continental world. It is a mighty oak, with stout and sturdy trunk, while America is the slender and flexible palm tree, so dear to this continent. The Old World—if it is allowable to employ here comparisons of this nature—calls to mind the square and solid figure of man; America, the lithe shape and delicate form of woman.

The direction of the principal reliefs, the prolongation of the Old World from east to west, and its more northern position, cause it to belong rather to the temperate s than to the zone of the tropics, and give, through- s whole length, a more similar climate.

America is distinguished by the simplicity of its [illegible] structure, and by the consequent unity of char- [illegible], the Old [illegible] contrary, presents the variety [illegible] structure [illegible] ast limits. While America,

as we have seen, is constructed upon one and the same plan in the two continents, the Old World has at least three, as many as its separate masses; one for Asia and Europe, one for Africa, a third for Australia; for, in spite of their resemblance in certain general features, common to them, as the law of the reliefs has taught us, each of these three continents has none the less its special structure, which is not the same in Australia as in Africa, nor in Africa as in Asia-Europe.

The great mass of Asia-Europe, which may be well called a single continent, of a triangular form, whose western point is Europe—Asia-Europe, by itself, forms already the pendant of the two Americas. Like the New World, it is divided into two parts by a long ridge of heights, of mountain chains, and of table lands, forming a line of the highest elevations, and the axis of this continent; the Himalaya, the Hindo-Khu, the Caucasus, the Alps, the Pyrenees, are analogous to the long American Cordilleras.

This ridge also divides the Old World into two unequal parts, but is not placed on one of the edges of the continents, as in America. It is only a little out of the centre, so that it divides the whole surface into two opposite slopes, unequal certainly, but the narrower is nevertheless considerable. The northern slope is more vast: it contains all the great plains of the North, but it is less favored by the climate, and by the forms of the soil. The southern slope is less extended, but it enjoys a more beautiful climate; nature is richer there; it is more indented, more variously moulded; it possesses all those fine peninsulas, the two Indies, Arabia, Asia Minor,

Greece, Italy, Spain, which form the wealth of Asia and Europe. Figure to yourselves the coasts of the Pacific, furnished with a series of peninsulas of this description, and you will have an idea of the augmentation of wealth that would result to America from such an addition.

We will point out still another difference.

While in America the plains are always situated on the same side of the chain of the Andes, in Asia-Europe the table lands and the plains are situated on the two sides of the continental axis alternately. Thus, in Eastern Asia, the great plateau of Tubet and Mongolia is on the north, and the plains of the Ganges are on the south. In Western Asia, on the contrary, the plateaus of Afghanistan and Persia are on the south, the plains of Tartary on the north. In Europe, a different situation still; on the south of the Alps and the Pyrenees are the peninsulas and their gulfs, the mountain chains and their plateaus; in general, countries more elevated, but broken and dispersed; on the north, are chains more varied, lower; countries more continuous, less cut up, and the great plains of the North of Germany. All the combinations seem, if I may say so, to have been exhausted.

This is not all yet. The axis of Asia-Europe, instead of forming a continuous wall, without gap and without breaks, like the Andes, is composed of several isolated systems, independent of each other, often leaving wide openings between them. Sometimes it is a sea that separates them; sometimes vast plains serve as high roads to the invading nations, who pass from one side to the other of this great barrier, from the northern to the

southern world. Thus, the lofty chains of the Himalaya, and of Hindo-Khu, sink towards the west and disappear, and no important ridge any longer separates the inhabitants of the steppes of Lake Aral from the dweller on the table land of Iran. The Caucasus rises abruptly from the level of the Caspian, and terminates in the same way at the margin of the Black Sea; and it is only upon the high shore of this sea that the mountains of Transylvania and the Balkan again begin to separate the northern from the southern world. This break opens to the polar winds and the northern tribes the broad gate which has cost the south such fierce assaults. The Alps, finally, do not touch the Pyrenees, and the Languedoc canal, uniting the Mediterranean with the ocean, proves the importance of this communication between the two basins.

Let us add, finally, that a large number of chains, parallel to this great line, and of others cutting it transversely, like the Bolor, the Ghauts of the Deccan, and the numerous chains of Indo-China, the Lebanus, the Oural, the Scandinavian Alps, to mention only the principal, cut the soil in all directions, divide it into a multitude of different basins, of natural regions, having their several limits, their climate, their special character, and we shall be convinced of the truth of the assertion, that in the Old World, variety of structure is carried to the extreme.

Thus, while America is distinguished by simplicity of forms and unity of plan, the Old World has in turn a diversity of reliefs, of combinations of mountain chains, of plateaus and of plains, multiplying to infinity those

differences, those interior contrasts, wherewith America is less richly provided, and which, as we know, are one of the most powerful means of development.

The character of the climate of the Old World, taken as a whole, is a result of all the general features of configuration we have thus far ascertained. The vast extent of this group of continents, the height and number of its table lands, the greater elevation of its eastern regions, close it against the influences of the ocean, scarcely holding its empire over the shores. If the climate of the New World bears, in general, the oceanic character, that of the Old World, on the other hand, is dry, comparatively hot, extreme; in a word, *continental*. If the western hemisphere is the humid side of our globe, the eastern hemisphere is the arid side.

The character of the climate of the Old World is reflected in the organic beings, as we might expect, and it stamps, on the vegetation and the animal world, a special impress, important to be noticed.

In the Old World the vegetation is less universal, less plentiful, than in the two Americas. Nowhere on its surface do we encounter virgin forests, whose extent can be compared with the boundless selvas of the Amazon; they are found, doubtless, in the tropical regions of Africa and the Indies; but they are rather local phenomena, and do not give their character to vast countries. On the other hand, the Old World is the world of steppes and deserts. Nowhere else are those dry and barren plains so numerous, so extensive, so unbroken. It is enough to mention the boundless steppes of Russia and Caucasus, of Siberia and the Altai, of Tartary and of

Turkestan; to recall to mind the great zone of deserts obliquely traversing the Old World in its greatest length, from the shores of the Atlantic, through Sahara, Arabia, Eastern Persia, and Mongolia, to the Pacific Ocean, and occupying all the central part of the lands of the three continents united, to be convinced that the distinctive character of the climate of the Old World is dryness.

The general forms and aspect of the plants themselves, at once declare the parsimony wherewith nature has provided for them the moisture so essential to their full development. Instead of expanding their surface for evaporation and absorption, their leaves seem to fold upon themselves, to concentrate themselves into a smaller volume; they have a tendency to approach the linear shape, the pointed form we notice in the pines; they often become membranous, leathery; or the plant is covered with a soft down, with a nap, or even with prickles, which are only leaves or branchlets, transformed and hardened under the influence of a dry air. Or, still further, they take those plump, fleshy, cylindrical forms, which seem struggling to contain the greatest quantity of vegetable matter in the smallest possible volume. Such is the flora of Southern Africa, with its Stapelias, its juicy Mesembryanthems, its brilliant Aloes, its delicate Mimosas, its Metrosideri, its heaths without number. Such is that of Australia with its forests of Eucalypti, its Banksias, and its Casuarinas, with their long and naked, pendant, thread-like branches. Such, moreover, is the flora of the steppes and the deserts of Arabia and Gobi, (for there, also, are still some scanty representatives of the vegetable world,) consisting en-

tirely of plants of a dry and ligneous nature, often clothed with white down, or of gray hues, imitating the color of the dust of the desert. In all these countries the forests are rare, of small extent, of little density; the scattered trees are not invaded by those woody climbers which elsewhere entangle and interweave them, and form those impenetrable masses of verdure which characterize the tropical wilds of the New World. Thus, in the vegetable kingdom of the Old World, there is oftener a scarcity, oftener a sufficiency, but rarely an abundance.

Nevertheless, because the vegetable does not reign there by its mass, is this saying that it reaches a less perfect organization? No, gentlemen, no such thing. It is this dry and warm climate that produces the delicate fruits of Persia and of Asia Minor, elaborates those refined juices, those perfumes, those fine aromas of the East, the fame of which was already established in the remotest antiquity. These same regions of the Old World have given us coffee from Arabia, and tea from the uttermost Orient, so precious to all the civilized nations. The East Indies and their archipelago, as we have said, under the influence of the vigor of the continent and the moisture of the ocean, yield those concentrated products, those strong spices, the nutmeg, the clove, the ginger, there in its native country; the pepper, the cinnamon, of which the whole world makes use. It is these same countries that present us the largest leaves and flowers known; there, also, grows the Banyan tree, the symbol of vegetable strength; it is in Africa that the huge Baobab unfolds itself — the Adansonia, whose trunk

sometimes measures twenty-five feet in diameter. Bu gentlemen, let us acknowledge it, these are the produc of favored spots; the common rule, — I do not speak quality, but of quantity, — the general rule of the O World is economy, and not superfluity.

But if vegetation in the Old World seems reduced a subordinate place, it is not so with animal life; th we find here in its fulness, and varied to a degree th New World knows nothing of. While it seems to b impoverished and subdued in the dank atmosphere o tropical America, it flourishes most of all in the dry, hot exciting climate of Africa and Asia.

America, as we have seen, is the domain of insect and reptiles, which prosper in the humid and vegetativ element.

The Old World is the domain of the higher animals the Mammalia, the number of which, their variety, thei strength, and their size, give character to the animal kingdom of these countries. As we have said, when comparing the animal kingdoms of the two worlds, not only the representatives of the corresponding families are larger and stronger in the Old World, but they appear in more numerous genera and more varied species, and even exhibit types entirely foreign to America, as the giraffe, the giant of the Ruminants.

The servants and companions of man, the horse, that noble animal which he can neither forego for his wants nor for his pleasures; the ox, more useful still; the dog, his faithful friend, are gifts the Old World has bestowed upon the New. Finally, the presence of the Chimpanzi of Africa, and of the Orang-outang of the Indies, whose

figure comes the nearest to man's, proves that the development of animal life reaches here the utmost limits it can attain, apart from man himself.

The animal kingdom, as we see, has, in the Old World, the preponderance over the vegetable, as in the New World the vegetable had over the animal. The kind of enemies man encounters in the one and the other world, when he struggles with nature, already tell us what is their character. In America, the overflowing rivers and their lowlands; the virgin forest, the climbing plants and their impenetrable thickets; the poisonous reptiles, and the devouring insects multiplying there, are his most formidable enemies. In Africa or in Asia, it is thirst, the moving sands, and the burning heat of the sun; it is the lion, the tiger, the hyena, and all the ferocious inhabitants of the desert, that menace his life and encompass him with ever-recurring dangers.

Let us raise ourselves higher still, and pass into the province of man himself. We find here the contrast between the two worlds still more marked. Instead of a single race, the copper-colored, dwelling in both Americas, from Labrador to Cape Horn, four different races, if not five, belong to the Old World, and testify to the variety of its plastic forms, and to their powerful influence upon the organization of man.

The white race is distinguished above them all: the most perfect type of humanity; the race best endowed with the gifts of intelligence, and with the profound moral and religious sentiment that brings man near to Him of whom he is the earthly image. To this race

belong, without exception, all the nations of high civilization, the truly historical nations; this still represents the highest degree of progress attained by mankind. After it, the Mongolian and Malayan races, which might be called the semi-historical nations, are still superior in civilization to the copper-colored. If we take even those races of the temperate regions of the Old World, at the lowest degree of the social scale, the nomadic tribes of the plateaus of Eastern Asia and of the western steppes, they are still far superior to the hunting tribes of the two Americas. There is even in the tropical man of the Old World, in Africa at least, a somewhat of native vigor of vital energy, manifested by his sanguine temperament, by his gayety, by his lively affections, and by his muscular strength, placing him higher than the Indian of tropical America. His social state, even, has made a step in advance. The negro tribes of Congo and Soudan form real commonwealths; they are acquainted with agriculture.

The density of the human population in the two worlds speaks with still greater emphasis. Taking the least uncertain numbers, we find that, while Europe counts 89 inhabitants to the square mile, Asia 32, and Africa 14, America has only 4. If we compare, then, either the races of the two worlds, or the civilized nations of Europe and of Asia, with those of the ancient inhabitants of Mexico and Peru; or, finally, the least cultivated tribes, the nomads and the negroes, with the hunting Indians of North and South America, the advantage, in various respects, will remain with the Old World.

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[illegible] of our planet are only the parts [illegible]. We see in advance—and for [illegible] traced out in the course of [illegible] in advance, that two [illegible] other cannot be confronted [illegible] without commencing a [illegible] them both. Thence, [illegible] worlds will be un- [illegible] whereof are [illegible] constituted,

which, embracing both, will raise them to the highest degree of improvement Providence seems to have decreed for them by nature itself, but which they cannot attain without each other's aid.

The inequality we have just established, is, then, an additional source of wealth, for it summons forth the mutual actions, and hastens the solution of this great contrast.

But how will this mutual action take place? Physical nature has exhausted its means of action for producing, by the intervention of the atmosphere and the winds, the mixture of land and sea, the diversity of climates and of organized beings, making the two worlds two distinct individuals; it cannot go further; it belongs now to man, for whom they were made, to human societies, to continue this work, to blend their two natures, and to establish between the two worlds the permanent bond that is to unite them. In their action upon the peoples and nations of the globe, all their physical differences must be reflected, and may be expected to display their true importance.

America lies glutted with its vegetable wealth, unworked, solitary. Its immense forests, its savannas, every year cover its soil with their remains, which, accumulated during the long ages of the world, form that deep bed of vegetable mould, that precious soil, awaiting only the hand of man to work out all the wealth of its inexhaustible fertility. Meantime, the human race of the New World, the Indian, the primitive owner of these vast territories, shows himself incapable or careless of the work; never has he opened

the soil with his ploughshare, to demand the treasures it encloses. Hunting is his livelihood; war his holiday. Upon a soil able to support millions of men in plenty, a few scattered inhabitants lead a wretched existence in the bosom of the wilderness.

Side by side with so much unused wealth, see the Old World, exhausted by long cultivation, overloaded with an exuberant population, full of spirit and life, but to whom severe labor hardly gives subsistence for the day; devoured by activity, but wanting resources and space to expand itself; and you will perceive that this state of things, that a disproportion so startling, cannot long exist. The gifts God bestows on man He requires should be employed, and He takes from him who does not put it to use, the talent which has been entrusted to him.

As the plant is made for the animal, as the vegetable world is made for the animal world, America is made for the man of the Old World. It is to the latter, as the active principle, that the first onset belongs.

Everything in nature is admirably prepared for this great work. The two worlds are looking face to face, and are, as it were, inclining towards each other. The Old World bends towards the New, and is ready to pour out its tribes, whom a resistless descent of the reliefs seems to sweep towards the Atlantic. America looks towards the Old World; all its slopes and its long plains sweep down to the Atlantic, towards Europe. It seems to wait with open and eager arms the beneficent influence of the man of the Old World. No barrier opposes their progress; the Andes and the Rocky

Mountains, banished to the other shore of the continent, will place no obstacle in their path. Soon the moment will come.

The man of the Old World sets out upon his way. Leaving the highlands of Asia, he descends from station to station towards Europe. Each of his steps is marked by a new civilization superior to the preceding, by a greater power of development. Arrived at the Atlantic, he pauses on the shore of this unknown ocean, the bounds of which he knows not, and turns upon his foot-prints for an instant. Under the influence of the soil of Europe, so richly organized, he works out slowly the numerous germs wherewith he is endowed. After this long and teeming repose, his faculties are reäwakened, he is reänimated. At the close of the fifteenth century, an unaccustomed movement agitates and vexes him from one end of the continent to the other. He has tilled the impoverished soil, and yet the number of his offspring increases. He turns his looks at once towards the east and the west, and sets out in search of new countries. His horizon enlarges; his activity preys upon him; he breaks his bounds.

Then recommences his adventurous career westward, as in the earliest ages. His intelligence has grown, and with it his power and hardihood. Under the guidance of the genius of the age, he attacks this dreaded ocean, of which, to this time, he knows only the margin. He abandons himself to the winds and the currents, which bear him gently towards the coasts of America. He is enraptured as he treads the shore of this land of wonders, still more adorned in

his eyes by all the fascinations his ardent imagination lends it.

The European establishes himself little by little upon this new land; he gets a foot-hold but slowly; for, to his shame be it said, the thirst for gold seems the only motive urging him thither; for gold, that factitious, cheating, transitory wealth, which in the long run impoverishes him who has it, because it puts his faculties asleep; that gold, fatal to Spain, the abundant possession of which was the signal of her decline. To make a fortune rapidly, by all possible means, and to return to Europe to enjoy it, this was the aim of the earliest colonists. These are not the true laborers in the great work that is beginning; these are only the trappers; these are not the civilizers of the New World; not to them shall it be given to be its true possessors.

Meantime new bands from beyond the seas soon discover that the real wealth of America lies in the fertility of the soil. Then begin the interchanges. The European plants, in this still virgin land, the useful vegetables he brings from the Old World, the sugar-cane, the coffee, the cotton, the spices, the cereal grains, more precious still, and draws therefrom abundant harvests. The New World gives to Europe, in exchange, the cocoa, the vanilla, the quinquina, the potato, above all, alone worth all the rest. The domestic animals, which are wanting in America, follow the footsteps of the colonists thither; the horse, the ass, the ox, the swine ... useful companions of man, that act so imp... in the domestic economy of

civilized nations, henceforth enrich this second half of the earth.

For a long time America is a daughter of the Old World, in her minority; and nevertheless, the colonial system already reacts profoundly upon the development of the European nations. During the three centuries following the discovery, the questions connected with the commerce of the world and the possession of the colonies grow every moment in importance. Every day brings with it the establishment of new colonies, and augments and reinforces those already existing. A local life makes no delay in displaying itself on this fresh soil. Whole peoples take root and increase with rapidity in the midst of that nature which yields them everything in abundance. They ask no more help from the mother country; they are in a condition to furnish it to *her;* the consciousness of strength grows with their prosperity.

But the hour of independence has struck; the fruit is ripe; it drops from the tree. The sons of the Old World have adopted America for their country; she has become their beloved mother. America takes her position face to face with Europe, not as a minor, but as a full-aged daughter—free, for it is her right. She throws herself alone, and on her own account, released from guardianship, with demeanor more open, more frank, more rapid, into the career of civilization. Now commences a new antagonism, more serious, more vast in its proportions. The two worlds treat as power with power; for two free and independent beings look upon each other. But, gentlemen, they are not enemies;

[illegible] made for each [illegible] of each other; they [illegible] other, not to unite [illegible] differences will only [illegible] a more extensive and [illegible] can give in abun-

[illegible] all the condi- [illegible] marriage. Is there [illegible] a common [illegible] which they are not [illegible] all the children of a [illegible] of the same civiliza- [illegible] and Saviour? [illegible] a still more [illegible] of character [illegible] from the special work [illegible] called as to an [illegible] this task is to work [illegible] and the wealth of the land Providence [illegible] for his own benefit and that of the [illegible] For this is the first work to be done, that [illegible] the futurity of America depends. He is accomplishing it — who does not know! — with a fiery activity. He has not too much of all the resources of industry the Old World and his own experience place at his disposal, to subdue and fashion at his pleasure this still somewhat savage nature.

Agriculture here already assumes proportions unknown everywhere else. Commerce, whose business is helping the world to share the wealth of its soil, is carried on upon the [illegible]nificent scale, and cannot

but become still more extended. From the very centre of the oceans where she reposes, America sends her ships and her merchandise to the ends of the earth. Steam will soon join the shores of the Atlantic and the Pacific, and place the United States on the great highway from Europe to China. Thus the American displays in every way a spirit of enterprise that goes even to the length of audacity. Nothing daunts him, nothing seems impossible to his activity. Every brain is teeming with the most gigantic projects, which find always an echo and support. There is certainly something of grandeur in the spectacle of the youthful vigor the inhabitant of the New World displays, of the intelligent energy with which he does his work. Whatever be its object — were it even not the most exalted — still such energy is worthy of admiration.

The work of Europe, her special task, at the present moment, is not the same; for her position is altogether different. Without doubt, industry, commerce, agriculture, employ a large part of her activity; but the exercise of these arts is not the predominant and characteristic feature of that ancient society. Other cares occupy her. The desire to know, rather than to possess; reflection, more than action; science, more than its application; movement and activity in the intellectual and moral world, rather than in the material world; — these are what distinguish the Old World and its ancient civilization.

Thus it is there that the high philosophical, moral, social questions are treated, which so profoundly task the present age; it is there that the thousand ideas, the

thousand diverse systems in all the branches of human science, whose variety seems an inextricable confusion to the eyes of the mind that does not master them, bud and blossom. The European is the man of ripened age, who reflects upon men and things, analyzes the causes, and seeks to understand the lessons of the spectacle the world presents. The American is the young man, full of fire and energy, surrendering himself entirely to his activity, and drawing from life the practical shrewdness and the sound sense experience gives. While the European discusses and reasons, the American acts and executes.

But, gentlemen, who does not see what there is exclusive in these two tendencies? Who does not understand to how many mutual wants these differences must give birth? how many exchanges of every kind they must stimulate? what activity, what fulness of life and of growth for both, what perfection of both will be the result of these intimate relations? Distressed Europe seemed unable to live longer without emptying its population into the lap of America. America cannot fulfil her destinies unless wrought out and brought into use by the intelligent races of the Old World. When this work, now just commencing, shall have been finished, then only shall we know all the importance of America to the entire race of man; all the importance of the reactions it is summoned to exercise upon the Old World.

The Old World is the world of germs; the New, the fruitful bosom giving them increase. Europe thinks; America acts. All these differences, calling for and com-

pleting each other, are they not the promise that this contrast of the Old World and the New will soon also be resolved into a grand and beautiful harmony that shall embrace the whole earth?

Yes, gentlemen, the futurity and the prosperity of mankind depend on the union of the two worlds. The bridals have been solemnized. We have witnessed the first interview, the preliminaries, the betrothal, the espousal, so fortunate for both. We already see enough to authorize us to cherish the fairest hopes, and to expect with confidence their realization.

LECTURE X.

Contrast of the three continents of the North and the three continents of the South — Physical characteristics of the two groups; the former more articulated, more consolidated, more similar; the latter more entire, more isolated, more different — These differences and analogies reproduced in the vegetation and the animal world — The three continents of the North temperate; the three of the South tropical — Superiority of the tropical climate in nature — Gradual increase of life, of the variety and improvement of the types of organized beings, in proportion to the warmth, from the poles to the equatorial regions — Man alone forms an exception — Law of the distribution of the human races — Geographical centre of mankind marked by the race of the highest perfection — Gradual degeneracy of the human type towards the southern extremities of the continents — The geographical distribution of the races of man and the animals founded upon a different principle — Advantage of the temperate climate for the improvement of man.

LADIES AND GENTLEMEN: —

We have considered the whole of the terrestrial masses, as grouped in two great individuals, the Old and the New World, which have exhibited themselves as possessing each a special character, particular advantages, but completing each other, and forming, as it were, two halves of one great organization. The union of these two worlds, the resources of which have been drawn out by the most intelligent and active races, by the most advanced societies, is the condition, and must become the means of a progress of the human race, much superior to what it would have been in each of

the two worlds isolated from each other. It is at least the hope given us by the law of the resolution of the contrasts into a more perfect harmonious unity, which is the natural product of all normal development. All that passes under our eyes at the present day, this life of interchanges between the two worlds, so active, so powerful, so progressive, is a proof that we are advancing irresistibly to so desirable a result.

We have now to consider our continents only under one remaining aspect, under a third point of view, which I hope will disclose to us some of the hidden influences they seem to exercise upon the life of man; or rather, which will enable us to observe one of those admirable harmonies of nature and history, arranged by the Creator himself for the improvement of this privileged being, for whom all nature seems made.

This third contrast, we have said, is that of the northern and of the southern hemisphere, or rather of the three continents of the North and the three continents of the South. We have considered the earth as divided into an Eastern World and a Western World; we shall now see it distributed into a Northern World and a Southern World.

I recall this curious disposition of the continental masses I pointed out, at our first interview, according to Steffens, which consists in this, that each northern continent has south of it a southern continent, more or less connected with it, whether materially by an isthmus or a chain of islands and an archipelago, or by the proximity of their extreme lands. The two continents, thus brought near together, make always a pair, the individ-

uals being at once connected and opposite in nature. Such are the two Americas, — a perfect type of the kind; such, again, are Europe and Africa, Asia and Australia.

This arrangement, then, gives us three continents in the North, and three in the South. Now, combining in this point of view the prevailing features of their physical configuration, of their situation and of their climate, I would show you: —

1. That the continents composing each of the two groups have common characters, the three in the North resembling each other, and the three in the South presenting equally strong analogies.

2. That these characters are different and opposed in the two groups, and constitute a contrast.

3. That this dissimilar nature assigns to the one a very different part from the others in the progress of human society.

Let us see, first, how they are distinguished by their general forms and by their configuration.

The continents of the North are more outspread, more extended, and, taken together, much more vast. They embrace all the plains of the arctic and temperate regions, the most considerable and the most continuous on the surface of the globe, and forming a great circular zone of low lands around the Frozen Ocean. The southern continents are more contracted, more narrowed and pointed, and, in the whole, less extensive. While the three first embrace a surface of 22½ millions of square miles, the last comprise only 16⅓ millions.

The continents of the North are more indented, more

articulated; their contours are more varied. Gulfs and inland seas cut very deep into the mass of their lands, and detach from the principal trunk a multitude of peninsulas, which, like so many different organs and members, are prepared for a life, in some sort, independent. A great number of continental islands are scattered along their shores, and are a new source of wealth to them. The plastic forms of the soil are still more varied. We have already seen that, in this respect, Europe and Asia present the most complicated structure, and the relative situations of the mountain chains and of their plateaus and their plains, exhaust, so to speak, all the possible combinations.

The southern continents, on the other hand, are massive, entire, without indentations, without inland seas or deep inlets, scanty in articulations of every kind, and in islands. They are trunks without members, bodies without organs, and the simplicity of their interior structure answers to the poverty of their exterior forms.

These differences are carried to the extreme in the Old World, where the rich border of peninsulas which deck the South of Asia and of Europe, hanging like the ample folds or the fringes of a royal robe, form a striking contrast to the mean and naked lines of Africa and Australia. In the New World, where this contrast is softened, by reason of the unity of plan we have clearly made out, the northern continent meantime possesses by itself the few peninsulas which detach themselves from its coasts, Yucatan, Florida, Nova Scotia, Labrador, California, and the peninsula of Aliaska.

Already, then, by the forms of their contours and of their relief, the continents of the North are more open to maritime life, to the life of commerce: they are more richly organized; they are better made to stimulate improvement.

The relative situations of the continents of the two groups are equally dissimilar.

The northern continents are brought nearer together, more consolidated. United, they form the central mass of all the lands of the globe, whence the others appear to radiate in all directions, losing themselves as they taper off in the ocean. For this reason, they have a more continental character. Owing to this greater nearness, to the facility of communication between one continent and another, to the analogy of their climate, which we shall speak of by-and-by, the three northern continents have a mutual relationship not to be mistaken. From the shores of the Pacific Ocean, along the coast of temperate Asia, even to the western extremity of Europe, the vegetation presents the same aspect, the same general physiognomy. The European traveller finds, from one end to the other of this immense space, the pine forests, the oaks, the elms, the maples his eye has been accustomed to from infancy. In the Himalaya, the Caucasus, or the Balkan, he beholds again with delight those humble but graceful forms of the flora he has become acquainted with in the Alps and the Pyrenees. If he crosses the Atlantic, what surprises him at the first glance is, not the novelty of the vegetable forms which he was perhaps expecting after a voyage of thirty-five hundred miles; it

is the resemblance of physiognomy and aspect, so great that, in the bosom of the vast forests of Ohio or Canada, he might almost believe he had not quitted the soil of Europe. Nevertheless, we hasten to say, this resemblance is not identity. The eye of the botanist, even that of the simple observer, would soon perceive that, if the types remain the same, the species are different. If they are almost always analogous, they are seldom identical.

In the animal world, the same analogy still. Nothing is more alike, at the first view, for example, than those thousands of coleopterous insects, which inhabit the two worlds. The same air, the same look in the corresponding species. It is a singular fact, observed also in the vegetative kingdom, and still a mystery, that a given genus, in Europe composed of a determinate number of species, is found again in America, with an almost equal number of corresponding species, with the same particularities of forms repeated, even to the design and to the same disposition of colors. And yet, to the trained eye of the naturalist, every American species constitutes one very distinct from the analogous species of the European continent. What takes place with regard to the genera and species is further true of certain families and tribes. The examples of this are numerous, and I would cite them but for the fear of offending your ears by names which would appear barbarous. Relations of the same kind exist between the vertebrates, between the fishes, between the birds of the two worlds, and it is to these deceptive resemblances that the confusion of species and the mistakes of syn-

onyms are owing, so numerous in American zoölogy, and so hurtful to its progress. The mammalia, finally, make no exception to this law. The reindeer is common to the polar regions of the three continents; the bison reminds one of the wild bull and the ox of Europe and of Asia; the bears, also, are but slightly different from those of the Old World; the elk and certain kinds of stags are so similar, that the zoölogist is still in doubt whether they constitute different species or not.

Thus the resemblance of the organized beings in the three continents of the North is one of their distinctive characters; and this character is due to the circumstance that, in proportion as the species change with the longitude, their place is taken generally, not by new types, but by analogous species. Doubtless the similarity of climate is one of the most active causes of this resemblance; for the variety of the genera, the differences between the species of the three continents, augment according to the elevation of temperature; but this is not enough to explain the fact entirely; we shall see that the continents of the South, under similar latitudes and in similar temperatures, offer types of animals and of vegetation very different in each of them.

The continents of the South are more remote from each other than the foregoing. Broad oceans separate them even to isolation. Scarcely any communication is possible between lands so distant; at all events, they are only indirect. Shut up in themselves, incapable of reacting upon each other and of modifying their respective natures, these continents are excluded from all community of life. What is there astonishing, then, in

seeing their differences carried to an extreme, their characters exaggerated?

The organized beings of the two kingdoms in these three continents have, in reality, almost ceased to possess anything in common. Not only the species that characterize their floras and their faunas are different, but they are no longer analogous, and the prevailing forms, the grand types, are partly quite different. This is true, above all, of their southern extremities, of their points, more isolated still than the central or northern parts. In Australia, it is the gigantic Myrtaceæ, the flaring Eucalypti, so varied; the Melaleucas, the numerous species of which compose the greater part of the trees of the forests; it is the graceful Mimosas, and their Acacias with leaf-like branches; it is the meagre Casuarinas, and still other forms whose stunted foliage betrays the dryness of the soil, that give a particular physiognomy to the whole aspect of nature. Marsupials of huge size, the kangaroos, and other analogous animals, gambol in these forests and in the vast savannas; in the marshes, the Ornithorhynchus, unknown to every other continent, whose shapeless type brings to mind the earliest ages of the world, and seems not to belong to the existing epoch.

In Southern Africa, other forms are found, another nature. With the pale foliage of the Proteaceæ, are blended the Stapelias, the aloes, with their pulpy leaves and their brilliant corollas; the Irideæ, with their bold bearing and splendid colors; the geraniums; the heaths, above all, the numberless species of which astonish the eye by their variety, as much as they charm it by their

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...ge ...the animated world ...The preponderance ...the richest regions, ...with the daz- ...then the clumsy armadillos, ...the ant-eaters, the ant-eating apes, and so ...the human characteristic of this continent, ...—all this has nothing to ...

...between the three southern continents there is ...no communion ...nt of the genera of the Australian ...flora scarcely ...are met with in Africa; no analogous ...species substitutes ...each other; none of those social ...plants ...ces in Europe, Asia, and ...m a like character. The ...e occupy a space scarcely ...the North of Europe by the ...so extensively ...the North, ...ance; in the ...

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The astronomical situation of these two groups is, in reality, quite different. In consequence of the general arrangement of the lands, crowding them in a mass towards the North, the three continents of the North are situated almost entirely in the temperate zone, in the middle latitudes. North America and Europe are entirely in the temperate and frozen zones; Asia is so with respect to its principal mass, and touches the tropical regions only by its southern extremity. Thus it is seven parts temperate and cold for one tropical.

The southern continents, on the contrary, expose their principal and most important mass to the rays of the equatorial sun. Africa has four parts out of five in the tropical zone, and the fifth is situated in the warm temperate, and moreover is divided into two narrow belts, separated on the north and the south of the body of the continent. South America has five parts out of six in the tropics, and the sixth part, temperate, is composed only of the southern point, the poorest in all respects, which cannot claim to stamp its character. Australia, finally, [illegible] three fifths only to the torrid zone; [illegible] uld be said that the other two fifths, [illegible] rm temperate zone, give it its distinc- [illegible] ive [illegible] so that we have called it the sub- tro

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continents had no other definite end than the exhibition of the whole physical life of nature. But let us not forget that they are to serve a much higher end still; they are to serve the development of man, and of human societies. It is in this two-fold point of view that we ought to consider them.

In the order of nature, and at the first approach, we cannot deny to the tropical continents a marked superiority. The most powerful spring of physical life, the most active source, surpassing all the others, is the heat of that life-giving orb the ancient poets sang, and the nations of the world, forgetting the only true Creator of all things, adored as the parent of Nature. But by reason of the spherical form of the earth, each district of the surface receives an unequal portion. Slanting, scattered, and feeble in the regions neighboring the poles, the beams of the sun assume more strength, and fall thicker in the middle regions; in those of the equator only, they gain all their intensity, all their splendor. Now, in this same proportion, we see the development of life increase in energy and variety, from the poles to the equator.

What do we, in reality, see in the polar and frozen countries of the North of our continent? During the greatest part of the year, life seems almost extinguished by the rigorous cold of a perpetual winter. A colorless and stunted vegetation, a few creeping shrubs, none of those stately forests, which everywhere make the ornament of the landscape; endless plains covered with mosses and lichens, composed of only a few species, notwithstanding the immense number of their indi-

viduals. This is the flora of the cold regions. The preponderance of the cryptogamous plants, that is, of the inferior forms of vegetation, the small number of the genera and the species, the absence or scarcity of arborescent vegetation, give it that character of poverty and uniformity which strikes us in these desolated lands. The animal kingdom, thanks to greater freedom of locomotion, is better represented; but the small number of types and the preponderance of marine animals, still keep up a character of inferiority not to be misunderstood.

In the temperate zone, the number of genera and species is more than doubled; the superior types acquire a fuller development and more importance. In the vegetation, the preponderance of the phanerogamous plants, the beauty of the forests, the appearance of evergreen trees, are the signs of an immense progress. Meantime, the soft tints, the modest forms, the winter sleep, still interrupting the life of vegetation during long months, tell us that the triumph of life is not yet complete. The same progress goes on in animal life; the land animals prevail; the animal species become more numerous and more diverse.

But it is in the hot region of the tropics that the life of nature displays its fullest energy, its greatest diversity, its most dazzling splendors. We have already seen what it can produce in those favored countries of India and the Indian archipelago, where all the conditions seem brought together to secure to physical life its richest development. The cryptogamous plants attain, in the arborescent ferns, the proportions of our forest trees.

to the temperate zones, from the temperate zones to the region of the greatest heat. Animal life grows in strength and development; the types are improved; intelligence increases; the forms approach the human figure; the orang-outang already stands erect upon his feet; trained up by man, he has been seen to sit at his table and to eat with him; the negro of the woods, deceived by these appearances, regards him as a degenerated brother, who holds his tongue only from a desire to get rid of work. Evidently the development of the animal here touches upon its highest expression.

This ascending series will then rise to its termination in man, who, in his figure, is the crowning excellence of the whole animal world, and the realization of its very idea; and the tropical man also will be the highest, the purest type of humanity, and, physically speaking, the most beautiful of his species. All zoölogy, all nature, gentlemen, authorize us to draw this conclusion, and, for my part, I have no hesitation in believing that it would be so if man had no other rank upon this earth, and no other functions than those assigned him by his physical nature.

No, indeed, gentlemen, it is no such thing. Who does not know that man makes here a wonderful exception? Far from exhibiting that harmonious outline, those noble and elevated forms, all those perfections the chisel of a Phidias or a Praxiteles has combined upon a single head, the tropical man displays only those unfortunate figures which seem to approach ever nearer and nearer the animal, and which betray the instincts of the brute; those figures which we always behold with, I know not

what of secret uneasiness, that would threaten to grow into disgust, were not the feeling lost in pity still more profound, and in the charity of a Christian heart. Even in that India, where physical life attains the utmost limits known to our earth, the indigenous man is a black; the white race—history compels us to believe it—has descended thither from the temperate regions of Western Asia.

If the distribution of the human races on the surface of the globe does not follow the law of the rest of nature, what, then, is the law that regulates it? Or, indeed, is there some great fact which may prove to be a rule in this seeming confusion?

Much has been said, gentlemen, much has been written, on this important question of the human races—one of the most difficult and the most delicate the science of nature and history can propose to itself. I am not going to discuss it here; but what I desire is, to establish, in this province also, a great general fact, which, as it seems to me, has not been sufficiently insisted on, and to which has not been attributed the importance it deserves. This fact is the following:

While all the types of animals and of plants go on decreasing in perfection, from the equatorial to the polar regions, in proportion to the temperatures, man presents to our view his purest, his most perfect type, at the very centre of the temperate continents, at the centre of Asia-Europe, in the regions of Iran, of Armenia, and of the Caucasus; and, departing from this geographical centre in the three grand directions of the lands, the types gradually lose the beauty of their forms, in proportion

to their distance, even to the extreme points of the southern continents, where we find the most deformed and degenerate races, and the lowest in the scale of humanity.

Please to cast a glance upon this series of drawings, portraits taken from nature, from individuals who seemed to have the most characteristic features of their respective races, and you will be convinced that the fact exists. (See plates v. and vi.)

Let us take for a type of the central region of Western Asia, this head of a Caucasian. What strikes us immediately is the regularity of the features, the grace of the lines, the perfect harmony of all the figure. The head is oval; no part is too prominent beyond the others; nothing salient nor angular disturbs the softness of the lines that round it. The face is divided into three equal parts by the line of the eyes and that of the mouth. The eyes are large, well cut, not too near the nose nor too far from it; their axis is placed on a single straight line, at right angles with the line of the nose. The facial angle is 90 degrees. The stature is tall, lithe, well proportioned; the shoulders neither too broad nor too narrow. The length of the extended arms is equal to the whole height of the body; in one word, all the proportions reveal the perfect harmony which is the essence of beauty. Such is the type of the white race—the Caucasian, as it has been agreed to call it—the most pure, the most perfect type of humanity.

In proportion as we depart from the geographical centre of the races of man, the regularity diminishes, the harmony of the proportions disappears. Let us

follow them first in the direction of Europe and of Africa.

Although the European may be considered as making a part of this central race, his features have less of regularity, of symmetry; but more animation, more mobility, more life, more expression. In him, beauty is less physical and more moral.

If we pass into Africa, we meet the Arab, who, whether in his own country or in Algeria, shows already a forehead slightly retreating, a head lengthened out of proportion. The Galla of Abyssinia is almost black, his long hair begins to crisp, his lips are often thick. The Caffre has the woolly hair and thick lips of the negro. The Hottentot, lastly, so struck the first colonists of the Cape by his ugliness, that he served for a long time as a symbol to express the most degraded state of humanity. On the other coast of Africa, more remote from Asia, the degeneracy of form is still more rapid. The Berbers of the Atlas still evidently belong to the Caucasian race; but their prolonged head, a tendency in the mouth to pouting, the spare and meagre forms, a deeper color, already herald a marked degeneration. The Fellatahs of Soudan, and still more the inhabitants of Senegal, bring us to the pure type of the Congo negro. In the latter, the retreating forehead, the prominent mouth, the thick lips, the flat nose, the woolly head, the strongly developed hind-head, announce the preponderance of the sensual and physical appetites over the nobler faculties of the intellect. At the extremity of Africa, the miserable Bushmen are still lower than the Hottentots; and, placed by the side of the

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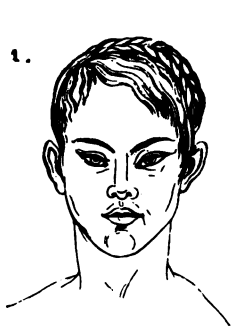
PLATE VI.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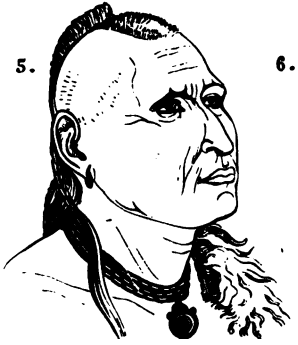
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Caucasian, make us see how immense the distance which separates them.

If, turning towards Eastern Asia, we direct our looks as far as the extremity of Australia, the decreasing beauty of the form is not less perceptible, not less gradual. The Mongolian, with his prominent cheek-bones, his eyes compressed, wide apart, and elevated at their outer corners, his triangular figure, his squab and square form, is wanting in harmony throughout his entire person. The Malays seem to have sprung from a mixture of the Mongolian with White race, which often improves the type. The Papoo of New Guinea, in spite of the blackness of his skin, still preserves some advantages of form; but the South Australian, with his gaunt body, his lean members, his bending knees, his hump back, his projecting jaws, presents the most melancholy assemblage the human figure can offer. These portraits of an Australian warrior and of a native woman of Van Diemen's Land, show the last degree to which ugliness can go in this being, created so perfect, and destined to be the lord of all the world.

In the third direction, that of America, the same law makes itself felt. This face of an Oto Indian chief would have still some advantages, if the prominence of the cheek-bones, a slight elevation of the outer angle of the eyes, and the size of the jaw, did not clearly betray a less perfect nature. In the South American Indian, all these defects are still more exaggerated, and give to the races of the South, compared with those of the North, a very marked character of inferiority. Finally, at the extreme point of the continent, and in

Terra del Fuego, live the Pecherays, the most misshapen, the farthest from any culture, the most wretched, of all the inhabitants of the New World.

It would be still the same in advancing towards the poles. Passing the Finns, we arrive at the Laplanders; through the Mongolians, we reach the Tongoos, the Samoiedes of Siberia, and the Esquimaux of North America.

Thus, in all directions, in proportion as we remove from the geographical seat of the most beautiful human type, the degeneration becomes greater, the debasement of the form more complete. Does not this surprising coincidence seem to designate those Caucasian regions as the cradle of man, the point of departure for the tribes of the earth?

It results from this remarkable distribution of the races of man, that the continents of the North, forming the central mass of the lands, are inhabited by the finest races, and present the most perfect types; while the continents of the South, forming the extreme and far-sundered points of the lands, are exclusively occupied by the inferior races, and the most imperfect representatives of human nature. This contrast is more decided in the Old World than in the New; nevertheless, in the latter, notwithstanding the inferiority of the copper-colored race, we have seen that the man of the Northern race, the Indian of Missouri, has a marked superiority over the Indian of the South, over the Botocudes, the Guaranis, and the Pecherays of South America.

The degree of culture of the nations bears a proportion to the nobleness of their race. The races of the northern

continents of the Old World alone are civilized; the southern continents have remained savage. In America, the civilized Aztecs of Mexico have come from the North. The ancient civilization of the Quichuas, at the summits of the Andes of Peru, scarcely seems itself indigenous to South America. It belongs elsewhere by its elevated position; it belongs to the temperate zone.

Now these differences between the North and the South are not of yesterday, nor to-day. If we consult the memorials of these tribes, without written history,—bounded and scanty as they are,—it might seem that it has been the same from a time ascending beyond all our traditions, if we except the Bible. No indication brings to light in these tropical continents the existence, at another epoch, of a purer type, of a more perfect race of men, than the inferior form we there meet with at the present day. The annals of the tribes in no part of these continents, record either the birth or the progress of a civilization which has contributed to the brilliant development of the present condition of man. Man has there always remained at the bottom of the scale of culture; while, from the earliest days of the world, history marks out the temperate continents as the seat of the refined communities. As there is a temperate hemisphere and a tropical hemisphere, we may, in the same manner, say there is a civilized hemisphere, and a savage hemisphere.

The distribution of man over the surface of the globe, and that of the other organized beings, are not then founded on the same principle. There is a particular law which presides over the distribution of the human

races and of civilized communities, taken at their cradle, in their infancy; a different law from that which governs the distribution of plants and animals.

In the latter, the degree of perfection of the types is proportional to the intensity of heat, and of the other agents stimulating the display of material life. The law is of a physical order.

In man, the degree of perfection of the types is in proportion to the degree of intellectual and moral improvement. The law is of a moral order.

Thus the geographical march of the perfection of the species, from the poles to the equator, is suddenly broken when man appears, to recommence on a plan wholly new.

This difference between the two laws has its principle in the profound difference existing between the nature and destination of these distinct beings. The plant and the animal are not required to become a different thing from what they already are at the moment of their birth. Their *idea*, as the philosophers would say, is realized in its fulness by the fact alone of their material appearance, and of their physical organization. The end of their existence is attained, for they are only of a physical nature. But with man it is quite otherwise. Man, created in the image of God, is of a free and moral nature. The physical man, however admirable may be his organization, is not the true man; he is not an aim, but a means; he is not an end, like the animal, but a beginning. There is another, new-born, but destined to grow up in him, and to unfold the moral and religious nature until he attain the perfect stature

of his master and pattern, who is Christ. It is the intellectual and the moral man, the spiritual man.

The law of development, if I may say so, is the law of man, the law of the human race, and of human societies; now, the free and moral being cannot unfold his nature without education; he cannot grow to maturity, except by the exercise of the faculties he has received as his inheritance.

Here is the reason, gentlemen, that the Creator has placed the cradle of mankind in the midst of the continents of the North, so well made, by their forms, by their structure, by their climate, as we shall soon see, to stimulate and hasten individual development and that of human societies; and not at the centre of the tropical regions, whose balmy, but enervating and treacherous, atmosphere would perhaps have lulled him to sleep the sleep of death in his very cradle.

Have we not the sad picture of what might have become of man, if he had had for his birth-place only the warm regions of the earth, in the wretched condition in which our unfortunate brethren of the inferior races still live, wandering to the furthest extremities of the tropical climates?

The fact of the gradual modification of the human types as we depart from a central race, seems to me to establish between all the varieties of mankind, however remote they may otherwise appear from the most perfect type, a bond of union, which, after having been established, science is not at liberty to pass over in silence, without taking into account. Now, if we consider the question of the formation of the races in the point of

view we have just assumed, perhaps we shall see this field, once so dark, illuminated by some gleams of light.

However, before proceeding further, let us set forth one fact more, no less undeniable; for, in speaking of man, we must not forget there are always two sides to consider; the one physical, the other moral.

Western Asia is not only the geographical centre of the human race, but it is, moreover, the spiritual centre; it is the cradle of man's moral nature. Was it not there that those divine teachings were proclaimed, which the most cultivated communities in the world regard as their dearest treasure, and every man who loves the true, acknowledges to be Truth itself? Was it not there that the chosen people lived, to whom they were given in trust to preserve for the world until the time appointed by the Supreme Wisdom? Was it not there that the Saviour of all the members of the human family appeared, and the gospel of grace and liberty was preached, in the lowly valleys of Judea—that gospel which recognized neither Jew, nor Greek, nor Gentile, nor barbarian, and which invites all the races of the earth to salvation, without distinction? Is it not from the height of the sacred mount where He died upon the cross for all, that Christ bids every human soul, whatever be the ephemeral form of its earthly covering, to a spiritual union which he will consummate in his glory? And these great facts, gentlemen, interesting to every human being, these facts whose blessed consequences surround us on all sides at the present day, belong not to the number of those that any

historical unbelief can ever strike out of the annals of mankind. Nor are they of secondary importance, considered merely in the results already accomplished; for who will maintain that, even in the future, man will ever witness an event more important for him than the appearance of the Saviour, and the proclamation of the universal gospel, destined to unite all men, and at the same time to bind them all to their common Creator?

Now, if man came from the hands of the divine Author of his being, pure and noble, it was in those privileged countries where God placed his cradle, in the focus of spiritual light, that he had the best chance to keep himself such. But how has he fallen elsewhere so low? It is because he was free, of a perfectible nature, and consequently capable also of falling. In the path of development, not to advance is to go back; it is impossible to remain stationary. The animal does not degenerate, because the form of his existence is necessary; he is not required to add anything. But man, who should grow in perfection by the constant exercise of the higher faculties of his nature, by struggling against the evil inclinations of a perverted will, man descends evermore, and proceeds from fall to fall, if he neglects those divine gifts, and abandons himself to the low instincts of his animal nature. He goes down to the life of the brute, whose form and semblance he takes. And what will come to pass if, separated from his God, and forgetting Him, he voluntarily stops the sources of the higher life, and moral life? Remote from the focus of tradition, where he might renew the temper of his faith, he

remains unarmed in combat with that mighty nature that subjugates him; he yields in the struggle, and, vanquished, bears soon upon his figure the ineffaceable mark of bondage. Thus, perhaps, might one, I do not say explain, but conceive, the incontestable influence of each continent, and each region of the earth, on the physical forms, the character and the temperament of the man who dwells in it, and the degeneracy of his type in proportion as he is removed from the place of his origin, and the focus of his religious traditions. Renouncing moral liberty, which exists only in goodness, man gives to nature power over himself, submits to it, and thus are traced and distinguished, a race of Eastern Asia, an African race, an Australian race, a Polynesian race, an American race. We must confess, however, it is not granted to follow out, either in nature or in history, the steps of this transformation; a transformation that could only have taken place, at the time when the human race in their infancy had still the flexible and plastic nature of the child; and we must repeat, the origin of the human races is a fact beyond our observation and anterior to all history, and, like all other origins, is screened by an impenetrable veil.

Since man is made to acquire the full possession and mastery of his faculties by toil, and by the exercise of all his energies, no climate could so well minister to his progress in this work as the climate of the temperate continents. It is easy to understand this.

An excessive heat enfeebles man; it invites to repose and inaction. In the tropical regions the power of life

in nature is carried to its highest degree; thus with the tropical man, the life of the body overmasters that of the soul; the physical instincts of our nature, those of the higher faculties; passion, sentiment, imagination, predominate over intellect and reason; the passive faculties over the active faculties. A nature too rich, too prodigal of her gifts, does not compel man to snatch from her his daily bread by his daily toil. A regular climate, the absence of a dormant season, render forethought of little use to him. Nothing invites him to that struggle of intelligence against nature, which raises the forces of man to so high a pitch, but which would seem here to be hopeless. Thus he never dreams of resisting this all-powerful physical nature; he is conquered by her; he submits to the yoke, and becomes again the animal man, in proportion as he abandons himself to these influences, forgetful of his high moral destination.

In the temperate climates all is activity, movement. The alternations of heat and cold, the changes of the seasons, a fresher and more bracing air, incite man to a constant struggle, to forethought, to the vigorous employment of all his faculties. A more economical nature yields nothing, except to the sweat of his brow; every gift on her part is a recompense for effort on his. Less mighty, less gigantesque, even while challenging man to the conflict, she leaves him the hope of victory; and if she does not show herself prodigal, she grants to his active and intelligent labor more than his necessities require; she allows him ease and leisure, which give him scope to cultivate all the lofty faculties

of his higher nature. Here, physical nature is not a tyrant, but a useful helper; the active faculties, the understanding and the reason, rule over the instincts and the passive faculties; the soul over the body; man over nature.

In the frozen regions man also contends with nature, but with a niggardly and severe nature; it is a desperate struggle, a struggle for life and death. With difficulty, by force of toil, he succeeds in providing a miserable support, which saves him from dying of hunger and hardship during the tedious winters of that climate. No higher culture is possible under such unfavorable conditions.

The man of the tropical regions is the son of a wealthy house. In the midst of the surrounding abundance, labor too often seems to him useless; to abandon himself to his inclinations is a more easy and agreeable pastime. A slave of his passions, an unfaithful servant, he leaves his faculties, the talent God has endowed him with, uncultivated and unused. The work of improvement with him is a failure.

The man of the polar regions is the beggar, overwhelmed with suffering, who, too happy if he but gain his daily bread, has no leisure to think of anything more exalted.

The man of the temperate regions, finally, is the man born in ease, in the *golden mean*, the most favored of all conditions. Invited to labor by everything around him, he soon finds, in the exercise of all his faculties, at once progress and well-being.

Thus, if the tropical continents have the wealth of

nature, the temperate continents are the most perfectly organized for the development of man. They are opposed to each other, as the body and the soul, as the inferior races and the superior races, as savage man and civilized man, as nature and history. This contrast, so marked, cannot remain an open one; it must be resolved. The history of the development of human societies will give us the solution, or at least will permit us to obtain a glimpse of the truth.

Since this is the salient and distinguishing feature, securing to them decidedly the first place, we shall this evening proceed to study them more in detail as the theatre of history.

We know beforehand, gentlemen, that the condition of an active, complete development is the multiplicity of the contrasts, of the differences, — springs of action and reaction, of mutual exchanges exciting and manifesting life under a thousand diverse forms. To this principle corresponds, in the organization of the animal, the greater number of its special organs; in the continents, the variety of the plastic forms of the soil, the localization of the strongly characterized physical districts, the nature of which stamps upon the people inhabiting them a special seal, and makes them so many complicated but distinct individuals.

The various combinations of grouping, of situation, with regard to each other, placing them in a permanent relation of friendship or hostility, of sympathy or of antipathy, of peace or of war, of interchange of religions, of manners, of civilization, complete this work, and give that impulse, that progressive movement, which is the trait whereby the historical nations are recognized.

We may, then, expect to see the great facts of the life of the nations connect themselves essentially with these differences of soil and climate, with these contrasts, that nature herself presents in the interior of the continents, and whose influence on the social development of man, although variable according to the times, is no less evident in all the periods of his history.

Let us commence our inquiry with the true theatre of history — with Asia-Europe.

We have already had occasion to call attention to the unity of plan exhibited in this great triangular mass, which authorizes us to consider it as forming, in a natural point of view, a single continent, whose subdivisions bear the imprint of only secondary differences. We have also indicated, as the most remarkable trait of its structure, that great dorsal ridge, composed of systems of the loftiest mountains, traversing it from one end to the other in the direction of the length, which may even be regarded as the axis of the continent. It is, in fact, on the two sides of this long line of more than 5,000 miles, on the north and south of the Himalaya, of the Caucasus, of the Balkan, the Alps, and the Pyrenees, that the high lands of the interior of the continent extend. It splits Asia-Europe into two portions, unequal in size, and differing from each other in their configuration and their climate. On the south, the areas are less vast; the lands are more indented, more detached — on the whole, perhaps, more elevated; it is the maritime zone of peninsulas. On the north, the great plains prevail; the peninsulas are rare, or of slight importance, the ground less varied.

But what chiefly distinguishes one of the two parts [illegible] other, what gives to each a peculiar nature, is [illegible]. These lofty barriers we have just named [illegible]erywhere separate the climates, as well as the [illegible]he gradual elevation of the terraces towards [illegible]n, up to this ridge of the continent, by prolong- [illegible] the [illegible] direction the frosts of the north,

augments still further, in Eastern Asia and in Europe, the difference of temperature between their sides, and renders it more sensible. Thus, almost everywhere, the transition is abrupt, the two natures wide apart. These high ridges arrest at once the icy winds of the poles, and the softened breezes of the south, and separate their domains. The Italian of our days, like the Roman of former times, boasts of his blue sky and his mild climate, and speaks with an ill-concealed contempt of the frosts and the ice of the countries beyond the Alps.

To the father of the Grecian poets, to Homer, who knows only the Ionian sky, the countries beyond the Hæmus are the regions of darkness, where rugged Boreas reigns supreme. At the northern foot of the Caucasus, the dry steppes of the Manytsch are swept by the frozen winds of the north; on the south, the warm and fertile plains of Georgia and of Imereth, feel no longer their assaults. In Eastern Asia, finally, the contrast is pushed to an extreme. The traveller, crossing the lofty chain of the Himalaya, passes suddenly from the polar climate of the high table lands of Tubet, to the tropical heats and the rich nature of the plains of the Indus and the Ganges. Yet, as we have said, this great wall, which separates the North from the South, is rent at several points. Between the Hindo-Khu and the Caucasus, the depressed edge of the table land of Khorasan, between the Caucasus and the Balkan, the plains of the Black Sea and of the Danube, open wide their gates to the winds and to the nations of the shores of the Caspian and the Volga. Between the Pyrenees and the Alps, the climates and the peoples of the South penetrate into the North.

Thus two opposite regions are confronted, one on the North, in the cool temperate zone, with its vast steppes and desert table-lands, its rigorous climates, its intense colds, its dry and starveling nature; the other on the South, in the warm temperate zone, with its beautiful peninsulas, its fertile plains, its blue heavens and its soft climate, its delicate fruits, its trees always green, its lovely and smiling nature.

The contrast of these two natures cannot fail to have a great influence on the peoples of the two regions. It is repeated, from the history of the very earliest ages, in the most remarkable manner. In the North the arid table lands, the steppes, and the forests, condemn man to the life of shepherds and hunters; the peoples are nomadic and barbarous. In the South, the fruitful plains and a more facile nature invite the peoples to agriculture; they form fixed establishments and become civilized. Thus in the very interior of the historical continent we find a civilized and a barbarous world, placed side by side.

Two worlds so different cannot remain in contact without reacting upon each other. The conflict begins, one might say, with history itself, and continues throughout its entire duration; there is scarcely one of the great evolutions, particularly in Asia, not connected with this incessant action and reaction of the North upon the South, and of the South upon the North, of the barbarian world upon the civilized world. At all periods we see torrents of barbarous nations of the North issuing from their borders and flooding the regions of civilization with their destroying waves. Like the boisterous and

icy winds of the regions they inhabit, they come suddenly as the tempest, and overturn everything in their way; nothing resists their rage. But as after the storm nature assumes a new strength, so the civilized nations, enervated by too long prosperity, are restored to life and youth by the mixture of these rough but vigorous children of the North. Such is the spectacle presented by the history of the great monarchies of Asia and of their dynasties; that of Europe is scarcely less fertile in struggles of this kind. Some examples, which I proceed to recall to your memory, will be enough to convince you of the powerful influence of this contrast.

As far as the memorials of history ascend, it exhibits, on the table land of Iran and in the neighboring plains of Bactriana, one of the earliest civilized nations, the ancient people of Zend. The Zendavesta, the sacred book of their legislator, displays everywhere deep traces of the conflict of Iran, of the southern region, of the light of civilization — *the Good* — with the Turan, the countries of the North, the darkness, the barbarous peoples — *the Evil.* Who can say that even the idea of this dualism — of Good and Evil — which is the very foundation of the religious philosophy of Zoroaster, is not, to a certain extent, the result of the hostile relations between two countries so completely different? Six centuries before Christ, the barbarous Scythians come down from the North, sweep like a whirlwind through the same gate of the Khorasan upon the plateau of Iran, overrun the flourishing kingdom of Media, and spread themselves as far as Egypt. A whole generation was necessary to restore to Cyaxares his crown, and to efface the traces of

this rude attack. In the eleventh century of our era, the Seldjouks Turks, descend from the heights of Bolor and Turkestan, invade first Eastern Persia, overturn the power of the Gaznevide Sultans, put an end to that of the Caliphs, and lord it over Western Asia. But nothing equals the tremendous shock caused through the whole of Asia by the invasion of the Mongolians. Issuing from their steppes and their deserts, under the conduct of the daring Gengis-Khan, the hero of his nation, their ferocious hordes extend like a devastating torrent from one end of Asia to another. Nothing withstands their onset; even Europe itself is threatened by these barbarians; all Russia is subjected, and scarcely can the assembled warriors of Germany drive them back from their frontiers, and save the nascent civilization of the West. China herself beholds a succession of conquerors establish in the North a brilliant empire, and for the first time the two Asias are subject to one and the same dominant people. India alone had been spared; she yields before a fresh invasion, and Sultan Babur — who already is no more a barbarian — founds, at the beginning of the sixteenth century, the mighty Mongolian Empire, which, in spite of its vicissitudes, has existed down to our days, and has yielded only to the power of the nations of civilized Europe. The history of China, lastly, is crowded with the struggles of the civilized people of the plain with the roving tribes of the neighboring table lands, and the last of these invasions, so frequent, — that of the Manchou Tartars, — has given to China its present rulers.

In Europe, the war of the North against the South,

though seemingly not so long continued, is not less serious. Six centuries before our era, bands of Celts, enticed by the attractions of the fertile countries of the South, set forth from Gaul, under the lead of Bellovese and Sigovese, cross the Alps, and proceed to establish themselves in the smiling plains of the Po. Other bands follow them thither, and found a new Gaul beyond the Alps. These impetuous children of the North soon press upon Etruria; and Rome, having drawn upon herself their anger, suffers the penalty of her rashness. About 390 B. C., the city was burnt, and the future mistress of the world well nigh perished in her cradle, by the strong hand of the very men of the North whom she was destined afterwards to subject to her laws. A century later, these same Gauls, finding Rome victorious and Italy shut against them, rush upon enervated Greece, give her up to pillage, and, profaning the sacred temple at Delphi, announce the fall of Hellas, and the last days of her glory and her liberty. Another troop of these bold adventurers cut their way into Asia Minor; they maintain themselves there, objects of terror in the land that bears their name, to the very moment when the power of Rome forced all the nations to bow beneath her iron yoke.

A century before the birth of our Saviour, the men of the North are again in motion. The Cimbri and the Teutons appear at the gates of Italy, and spread terror even to Rome herself. Forty years have scarce rolled away when Rome, in her turn, assails the Northern World. Cæsar marches to conquer the Gauls, formerly so terrible, and in the course of the ages, they are won

[illegible] Thus, by the third gate which opens [illegible] the Southern World penetrates [illegible] the North.

[illegible] more earnest struggle then commences. [illegible] have preserved their native energy, and [illegible] Rome is declining, and, little by little, [illegible] in that immense body are drying up. [illegible] the more the men of the North [illegible] the mighty colossus, whose head is still of [illegible] its feet are of clay. It falls, for its own [illegible] and that of humanity; a new sap — the fresh [illegible] the Northmen — is to circulate through it; [illegible] shall be born again, full of strength and life.

You see, gentlemen, from the beginning to the end of history, the contrast of these two natures exercises its mighty influence. The struggle between the peoples of the two worlds is constant. In Asia it may be again renewed, for nature there is unconquerable, and the contrast still exists. In Europe, the coarse struggle of brute strength of the early days has ended, since, culture having passed into the North, conquerors and conquered, civilized men and barbarians, have melted down into one and the same people, to rise to a civilization far superior to the preceding. But we behold it reappear, less material but not less evident, between the free and intelligent thinker, and the Protestant of the North, and the artistic, impassioned, superstitious, Catholic man of the South.

Let us pass now to a second feature of the structure of the continent Asia-Europe, which has almost as much weight as that we have just discussed.

Long chains, extending from the north to the south, in the direction of the meridians, the Bolor and Mt. Soliman, cut at right angles the great east-west axis. The Bolor forms the western margin of the high central plateau; the Soliman, the eastern margin of the table land of Iran; — the one on the north, the other on the south; — so that these two solid masses touch each other at their opposite angles, south-west and north-east. The remarkable point where these high ranges intersect, and the table land and the plains, lying outspread at their feet, touch each other, is the Hindo-Khu. These features of relief sever the continent into two parts, of almost equal extent, but of very unequal importance; Eastern Asia on the one side, and Western Asia and Europe on the other — the Mongolian races, and the White races.

This separation is so deeply marked in nature and in the nations, that even the ancients, with the practical sense belonging to them, made a division of Asia *intra Imaum*, and Asia *extra Imaum;* that is, Asia this side and Asia beyond the Bolor and the Hindo-Khu; as they also divided the North and the South into Scythia — Nomadic Asia — and Asia proper, or civilized Asia.

Eastern Asia forms, in fact, a continent by itself alone. A vast pile of highlands, a plateau in the form of a trapezium, occupies the entire centre, and forms the principal mass. It seems to invade everything; it is the prominent feature, and gives a distinctive physiognomy to the continent. It is surrounded on all sides by lofty ranges capped with snow, which seem, like towering ramparts, to guard it from attack, and to isolate it on

Obi, the Jenisey, the Lena; on the east the low country of China, where meet and unite the two giant rivers of the Old World—those two twin rivers, which, born in the same cradle, flow on to die in the same ocean. On the south, the plain of Hindoostan, moistened by the fresh and abundant waters of the Himalaya, and the sacred streams of the Indus and the Ganges; on the west, finally, the plain of Turan, with the two rivers of Gihon and Sihon, and its salt seas, to which Western Asia already lays claim. In these plains, with fruitful alluvial soil, and on the banks of these blessed rivers, were developed the earliest, almost the only, civilized nations belonging to this continent. But the warm and maritime region of the East and the South, connected with the rich peninsulas of India, is by far the most favored of all. China and India, therefore, have given birth to the two great cultivated nations of Eastern Asia.

Nevertheless, as the great central ridge swerves obliquely towards the south, this warm and fortunate region forms only a narrow strip, not to be compared in extent with the cold, and sterile, and barbarous world of the North. This predominates, and decides its character.

Such are the distinctive features of Eastern Asia. What strikes us, in this world of the remotest East, is its gigantic proportions. The loftiest mountains of the earth, the most massive table lands, the most extensive plains, peninsulas which are small continents, rivers that have no rivals in the Old World, give it a character of grandeur and majesty not elsewhere to be found

But, it is easily understood, nowhere are the differences also so strongly drawn, so huge, so invincible. Nowhere is the contrast between the high lands and the low lands, between the heat and the cold, between the moisture and the dryness, abundance and sterility, presented on so vast a scale. See, by the side of the low, burning, and productive plains of Hindoostan, ten or fifteen thousand feet higher up, the cold and arid highland plain of Tubet and Tangout; by the side of China and its populous cities, the elevated deserts and the tents of the nomads of Mongolia. The differences are everywhere pushed to their utmost limit.

Furthermore—and this characteristic completes the picture—the communications from one region to another are always difficult. One thoroughfare alone, the valley of the Peschawer, leads from Persia to India, and has been the highway of all the conquerors, from Alexander to Babur and to the English. No practicable road for armies or for regular commerce unites India and China; the peninsulas communicate only by sea. The passes of the Himalaya are at an elevation of from ten to eighteen thousand feet; those of the Bolor are frozen in the middle of summer. At all times, the passage of the plateau is a difficult and tedious undertaking, and at certain points almost impossible.

Eastern Asia is, then, preëminently, the country of contrasts, of isolated and strongly characterized regions; for each forms a world apart, and is sufficient unto itself.

What must be the effect of this strong and massive

nature upon the nations who live under its influence, istory will inform us.

As Eastern Asia has a physical nature belonging specially to itself, so it has a particular race of men—he Mongolian race. We have already pointed out the xternal characteristics of the Mongolian family. With t, the melancholic temperament seems to prevail; the ntellect, moderate in range, exercises itself upon the letails, but never rises to the general ideas or high peculations of science and philosophy. Ingenious, nventive, full of sagacity for the useful arts and the onveniences of life, the Mongolian, nevertheless, is ncompetent to generalize their application. Wholly urned to the things of earth, the world of ideas, the piritual world, seems closed against him. His entire hilosophy and religion are reduced to a code of social norals limited to the expression of those principles of uman conscience, without the observance of which ociety is impossible.

The principal seat of the Mongolian race is the entral table land of Asia. The roaming life and the atriarchal form of their societies are the necessary onsequence of the sterile and arid nature of the regions ney inhabit. In this social state, the relations and the es which unite the individuals of the same nation are nposed by kindred, by birth; that is, by nature. Asociation is compulsory, not of free consent, as in more nproved societies. Thus, the greater part of Eastern sia seems doomed to remain in this inferior state of ulture; for the whole North—Siberia and its vast

exist. But the influence of the climate of the tropics gives to the intuitive faculties an exaggerated preponderance over the active faculties. The real, positive world disappears from his eyes. Thus, in his literature, so rich in works of high philosophy, of poetry and religion, we seek in vain for the annals of his history, or any treatise on science, any of those collections of observations so numerous among the Chinese. In spite of these defects the Hindoo civilization, compared to that of China, bears a character of superiority, which betrays its noble origin. It is the civilization of the western races transported and placed under the influence of the East.

But there is one characteristic common to all these civilizations of the uttermost East, deserving our particular attention. Born in the earliest ages of the world, (for without admitting—far from it—the fabulous antiquity their own traditions assign them, we may regard them as belonging to the most ancient in the world,) they seem to grow rapidly at first, and at the remotest period recorded by history they have already acquired the degree of development and all the leading features that distinguish them at the present day. Nearly fifteen hundred years before Christ—others say two thousand—India already possessed the Vedas—those religious and philosophical works, which already suppose a high culture and its accompanying social state. Alexander finds it flourishing and brilliant still, but little changed; the description the historians of his conquests have left, is true of modern India when invaded by the English. As much may be said of China, whose

empers or corrects them; their character is more individual. Such is the strength of these civilizations, that hordes of conquerors are successively absorbed, without modifying them, almost without leaving a trace behind.

But individuality is here carried to egoism. Of this very isolation which causes their inferiority, and kills all progress, they make a conservative principle. The Hindoo cannot leave his country except by sea; the Vedas forbid it under pain of pollution. Japan and China obstinately close their borders against all the nations of Europe, and it is only at the cannon's mouth that the English have opened the gates so long shut, and forced them to the life of interchange which will restore them to progress and vitality. Thus, while everything around them is advancing, India and China have remained stationary. For it is not given to one people alone, any more than to one individual alone, to run through the whole compass of the scale of human progress, by themselves and without the aid of their brethren. Eastern Asia is, then, the continent of extreme contrasts and of isolated regions; of races essentially Mongolian; of stationary civilizations; of the semi-historical nations. It is not there that the work of the development of humanity can be achieved.

The second half of the Old World, in the temperate region, Western Asia and Europe, forms another whole, wherein we are able to point out several common characteristics. Besides the division into a North and a South, on the two sides of the continental axis, the most salient feature is the long table land of Iran, stretching uninterruptedly from India to the extremity of Asia

Minor, and even prolonging itself, without losing its nature, across the peninsulas of the Mediterranean, as far as Spain.

From one end of these regions to the other, nature wears a character of uniformity. Everywhere the same cretaceous and jurassic limestone deposits form the greater part of the ground; everywhere volcanoes rise from the earth, and shake it with their convulsions. The climate, also, is alike; for in Asia a more southern latitude is counterbalanced by a greater elevation of the plateaus. The flora is analogous; the cultivated plants, the fruits, the domestic animals, are the same, with the exception of the camel of the desert, useless to Europe. Finally, the white Caucasian race, the most noble, the most intellectual of the human species, and all the nations of progressive civilization, dwell there. If we add Egypt and the vicinage of the Atlas, which belong to the Mediterranean, it is the true theatre of history, in the proper meaning of that word.

Nevertheless, in spite of this real community of characteristics, it is easy to detect, in Western Asia and Europe, certain differences not less important, that force us to consider them still as two distinct continents.

In Europe, in the southern zone, the plateau loses its continuity, and splits into peninsulas. In the northern zone, the arid steppes and the deserts are changed beyond the Oural into a fertile soil, more elevated, well watered, covered with forests, and susceptible of cultivation. The areas become gradually smaller, and the whole continent is only a great peninsula, of which the headland turning towards the west juts out into the

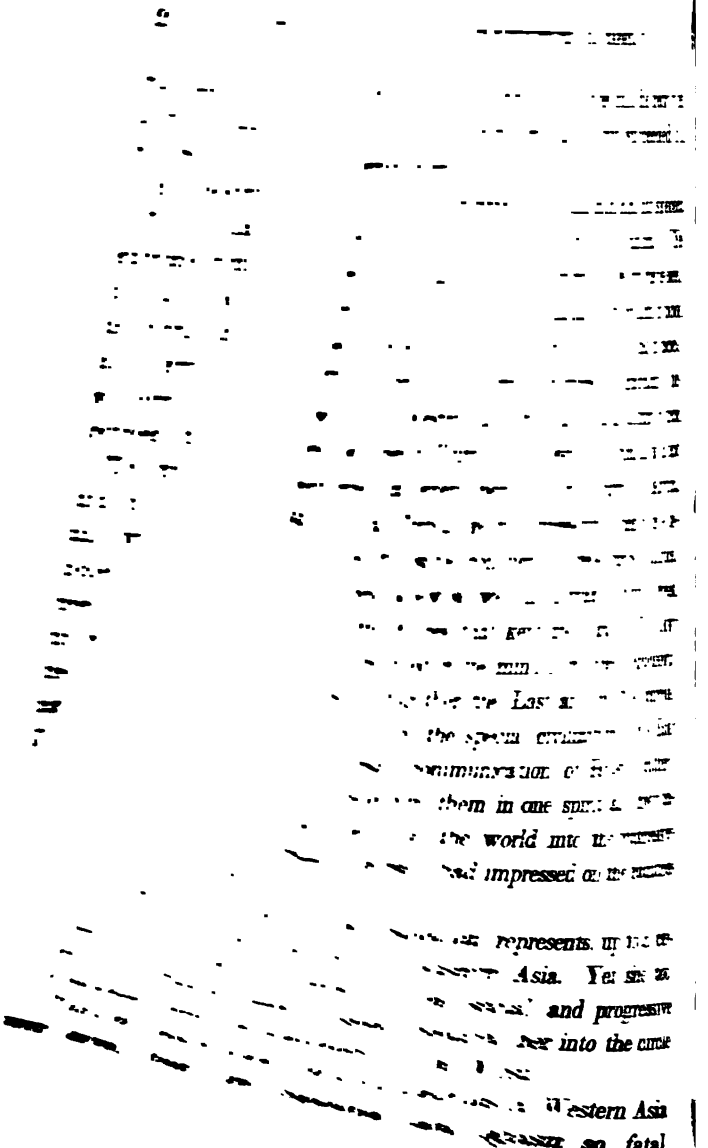
ocean. The north-east direction of the continental axis crowding the lands further north, and the influence of the ocean, give it a wetter and more temperate climate. Let us further examine these two portions of Asia-Europe, considered in the historical point of view.

Western Asia is placed in the middle portion of the continent Asia-Europe, between the two extremes. Like Eastern Asia, it has for its centre and prominent feature, a table land encircled with mountains, the plateau of Iran and of Asia Minor; but it is narrower, more elongated. The mountain chains are less elevated, less continuous. The mountains of Kurdistan and of the Taurus, which edge it on the south, attain a height of ten or twelve thousand feet only at a few points. The higher mountains, as the Ararat, are isolated, or form a chain, detached from the mass, like the Caucasus. We have already said that the north-east side is low and entirely open. The deep valley of Peschawer cuts its eastern side, and opens a passage towards India. Not only is this plateau more accessible than that of Eastern Asia, by reason of these forms of relief, but very different from the latter, which is far from any ocean, it is bathed at its very feet, on the four corners, by inland seas, that are so many new outlets. On the south, the Arabian Sea, the Persian Gulf, and the Mediterranean; on the north, the Caspian and the Black Sea.

Low and fertile plains, watered by twin streams, stretch at the foot of the table land of Iran. On the south, the plain of the Euphrates and the Tigris, the unequalled fertility whereof ceases with the rich allu-

we behold them descend into the arable plains, and spread towards all the quarters of the horizon. The ancient people of Assyria and Babylonia pass down the Euphrates and the Tigris into the plains of the South, and there unfold, perhaps the most ancient of all human civilization. First, the Zend nation dwells along the Araxes, then, by the road of the plateau, proceeds to found, in the plains of the Oxus, one of the most remarkable and the most mysterious of the primitive communities of Asia. A branch of the same people, or a kindred people — the intimate connection of their language confirms it — comes down into India, and there puts forth that brilliant and flourishing civilization of the Brahmins, of which we have already spoken. Arabia and the North of Africa receive their inhabitants by Soristan; South Europe, perhaps, by the same routes, through Asia Minor; the North, finally, through the Caucasus, whence issue, in succession, the Celts, the Germans, and many other tribes, who hold in reserve their native vigor for the future destinies of this continent. *There* then is the cradle of the white race at least — of the historical people — if it is not that of all mankind.

The civilizations of Western Asia also, as well as those of Eastern Asia, spring up in the alluvial plains which are easily tilled, and alike connect themselves with the great rivers, and not, as in Europe, with the seas. The plains of Babylonia and of Bactriana are continental, and not maritime, like India and China. The contrasts of nature are still strongly expressed, but yet less so than in the East. There are still vast spaces, and consequently vast states. The religions, the polit-



India. They perished in appearance, to sow among the very nations who uerors, the prolific seeds of a fairer the future should gather the fruits.

ier turn, has a character quite special, l features we have already pointed out. tructed upon the same fundamental plan Asias, it is only the peninsular head- is continent. Here are no more of those forms of Eastern Asia, no more of those paces, no more of those obstacles against orces of man are powerless, of those contrasts r the opposite natures, even to incompatibil- areas contract and shrink; the plateaus and tains are lowered; the continent opens on all one of those mortal deserts to cross, none of passable mountain chains, which imprison the . From the foot of Italy to the head of Cape from the coasts of the Atlantic to the shores of aspian, there is no obstacle a little art may not come without much effort. The whole continent ore accessible; it seems more wieldy, better fashioned man.

nd yet, gentlemen, all the contrasts of both Asias st, but they are softened, tempered. There is a thern World, and a Southern World, but they are different, less hostile; their climates are more alike. ead of the tropical plains of India, we find there the ls of Lombardy; instead of the Himalaya, the Alps; ead of the plateaus of Tubet, those of Bavaria. The rasts are even more varied, more numerous still.

;ions it presents, to bring into being, and to raise up many different nations and peoples.

But it is not alone for the individual education of :h people that Europe excels; it is still more ad- rably adapted than any other continent to favor common relations of the countries with each other; ncrease their reciprocal influence, to stimulate them mutual intercourse. The smallness of the areas, near neighborhood, the midland seas thick strown h islands, the *permeability* of the entire continent ıardon me the word—everything conspires to estab- between the European nations that community life and of civilization which forms one of the :t essential and precious characteristics of their al state.

merica, finally, the third continent of the North, ents itself to us under an aspect entirely different. are already acquainted with its structure, founded plan widely departing from that of Asia-Europe; know that its characteristic is simplicity, unity. to this feature its vast extents, its fruitful plains, ıumberless rivers, the prodigious facility of com- ication, nowhere impeded by serious obstacles, its ıic position, finally, and we shall see that it is ', not to give birth and growth to a new civiliza- but to receive one ready-made, and to furnish forth an, whose education the Old World has completed, ıost magnificent theatre, the scene most worthy activity. It is *here* that all the peoples of Europe meet together, with room enough to move in; :ommingle their efforts and their gifts, and carry

LECTURE XII.

ıgraphical march of history — Asia the cradle of civilization — Common character of the primitive natıons — Powerful influence of nature — The human race in its infancy lives under authority, which becomes slavery — Civilization passes to Europe — Greece; period of youth; emancipation, and intellectual and moral development; action in the East and West; the Greek the teacher of the world — Rome; ıer work, political and social — Inability of the Ancient World to ttain the end of humanity — Coming of Christ; his doctrines new in historical point of view — The Germanic Christian world begins heir application — Civilization passes to the North, and embraces all Europe; its different phases — Europe owes it to the rest of the world - Discovery of America — Universal inroad of the civilized nations — ocial work begun at the same time — America must finish it — The ople of the future; by what signs recognized — Conclusions — Foreen solution of the contrast of the three Northern continents and the ree Southern — Duties of the privileged races towards the inferior — few words upon the method pursued — Science and faith.

ES AND GENTLEMEN :—

he examination we have made of the structure of northern continents, considered in respect of the ience they exercise through their physical nature ı the condition of human societies, enables us to e in advance that they are formed to act different ı in the education of mankind. It remains to be whether the course of history will confirm these ipations. Now, if we find a real concordance, a ıony between these two orders of facts, we mav

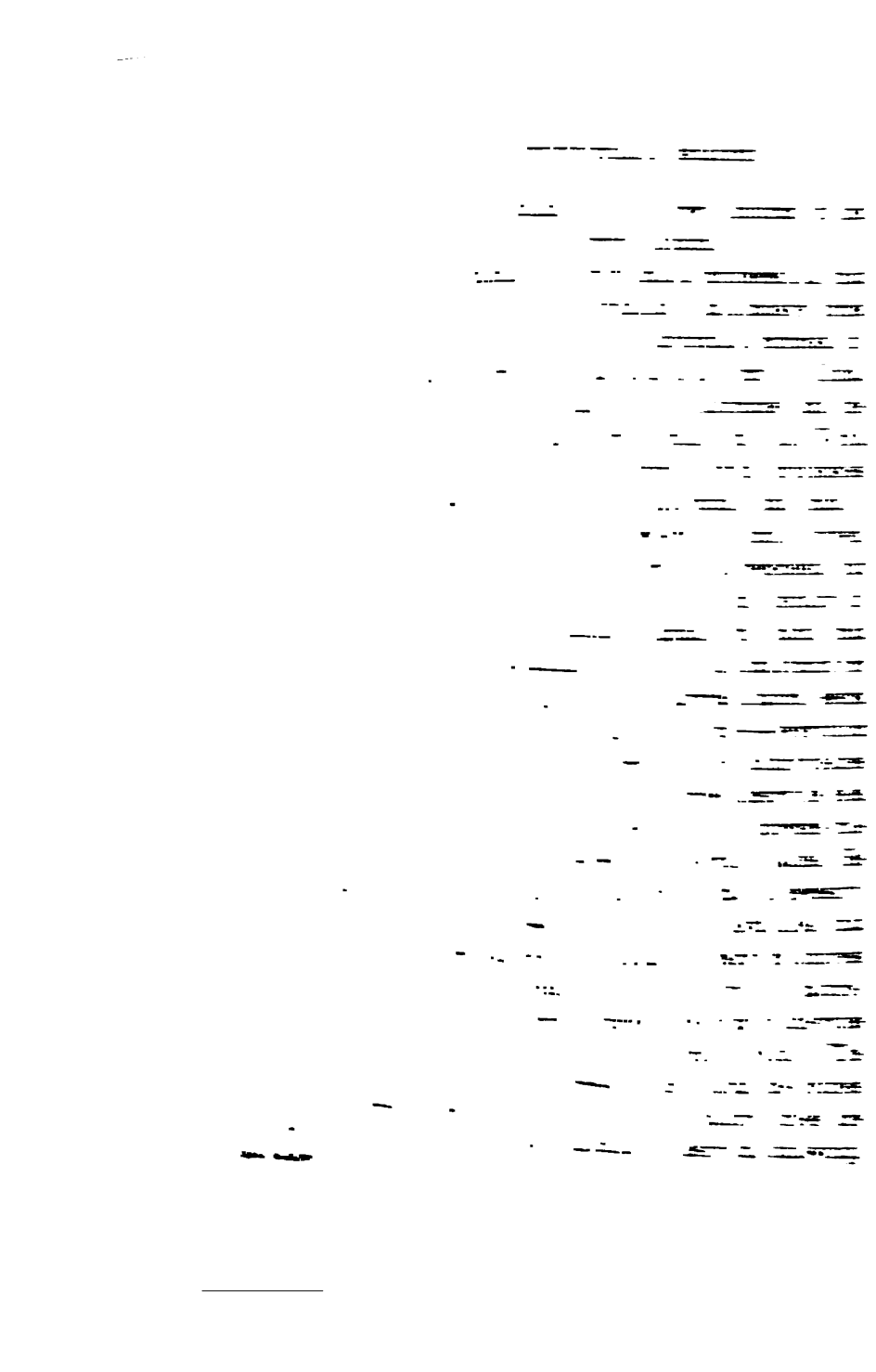
Brahmins come down from the regions of the Hindo-Chu, and from Cashmere, into the plains of the Indus and the Ganges; Assyria and Bactriana receive their inhabitants from the table lands of Armenia and Persia.

These alluvial plains, watered by their twin rivers, were better formed than all other countries of the globe, to render the first steps of man, an infant still, easy in the career of civilized life. A rich soil, on which overflowing rivers spread every year a fruitful loam, as in Egypt, and one where the plough is almost useless, so movable and so easily tilled is it, a warm climate, finally, secure to the inhabitants of these fortunate regions plentiful harvests in return for light labor. Nevertheless, the conflict with the river itself and with the desert, which, on the banks of the Euphrates, as on those of the Nile and the Indus, is ever threatening to invade the cultivated lands, the necessity of irrigation, the inconstancy of the seasons, keep forethought alive and give birth to the useful arts and to the sciences of observation. The abundance of resources, the absence of every obstacle, of all separation between the different parts of these vast plains, allow the aggregation of a great number of men upon one and the same space, and facilitate the formation of those mighty primitive states which amaze us by the grandeur of their proportions.

Each of them finds upon its own soil all that is necessary for a brilliant exhibition of its resources. We see these nations come rapidly forward and reach in the most ancient antiquity a degree of culture, of which the peoples and the monuments of Egypt and of India, and

is the supreme good; all that departs from it is evil. Man created free must fulfil it freely, and with consciousness of its excellence; but this very liberty, the most infallible sign of the nobleness of his nature, conceals the danger of a fearful fall. This liberty led the men of the earliest times on to that pitch of wickedness which rendered necessary the first great catastrophe of the human race, that earliest great punishment of the flood, of which all nations, even the most barbarous, have preserved an appalling memory. Above all things is the duty of man, if the work of his discipline is not to stop short of its end, to learn his dependence upon the Judge of good and of evil; to learn that saving fear of God which is the beginning of wisdom, and which alone can regulate the employment of his liberty, and hinder him from surrendering himself to the irregular inclinations of his finite nature. Now, God had revealed himself to man; had made known to him his will, and pointed out the path which he ought to have followed. The Creator himself condescended to guide the steps of his creature upon the long journey he had to travel. This is what the Bible tells us; this is confirmed by the vague memorials of all the primitive nations, whose most traditions, those antecedent to the philosophical theogonies prevalent at a later period, and giving them their specific character, contain always some disfigured fragment of this divine history.

But man soon became unfaithful; like a true prodigal son he abandoned the benevolent Father, under whose protection he was living; he cast off the yoke easy to bear; he forgot the living God who had been revealed



There all science appears as traditional. Man attains
ɔt to the light by his own activity. The truth is not
e recompense of his efforts, of his progress, of the free
ıfolding of his faculties. It is transmitted to him
:eady prepared from elsewhere.

In social life, casts, separated by insurmountable bar-
rs consecrated by religion itself; or, in the patriarchal
.te, domestic relations, imposed by nature, restrain the
e movement of the human faculties.

'n political life, absolute monarchy, the entire organi-
ion of which is only the earthly image of the great
estial Court of the Sun and his retinue, and of which
chief, representative of the Deity himself, is clothed
ı an unlimited power like him, and like him pro-
nces irrevocable decrees.

uch are the features common to all the civilized com-
ıities of the early East; one people alone forms an
:ption, — poor and insignificant in appearance, but
t in its destinies; — it is the Jewish people, the
le of God. In the midst of the defection of all the
ons, they received the glorious mission of preserving
e world the knowledge of the only personal, living,
:rue God. Placed under His law, they would have
able to show, had they remained always faithful,
man might have become under the paternal gov-
ent of His Creator; but their history is scarcely
ing but that of disobedience and chastisement, and
bles us the better to see that at this first period of
:velopment, man is under the law, and not under
onomy of grace and liberty.

ing the long centuries of these first ages, man h

Greek bears that eminently human character which betrays the preponderance of human personality and the energy of individual character.

His religion is a deification of the faculties and affections of man. In place of the passionless, immovable deities of Egypt and of Persia, his Olympus presents the animated spectacle of an assembly of human persons, free and independent, presided over by the happy conqueror of the elder gods of nature. Destiny, banished almost beyond the confines of heaven, hardly reminds us of those blind and deaf gods, those gods of necessity, who reigned absolutely over all the East. When the forces of nature, when the trees of the forests, the mountains, the springs, and the rivers, appear as objects of worship, it is under the form of gods, of goddesses, and of nymphs, endowed with all the affections, and subject to all the weaknesses of common mortals.

Greek science is no longer merely traditional; we see its birth and its growth; it is the production of the efforts of the human soul; it is progressive; the Greek no longer goes to the outer world of nature in search of wisdom, but descends to the depths of human consciousness.

With Socrates and his school, philosophy has passed from the realm of nature into the realm of man; it has become a moral philosophy.

In the social life of the Greeks, no more castes, no more of those hard sacerdotal despotisms of the East, which, by regulating human existence in detail, hinder improvement; but communities of free and equal men, the predominance of democracy, that is, of individual and local life; these are its characteristics.

[redacted]

and the arts on the soil of Greece; and Greece, conquered by arms, still reigns by her genius over her very conquerors.

Nevertheless, gentlemen, the Greek, who carried the individual culture of man to so high a pitch, knew not how to establish the social relations on a solid basis, nor to organize a national body, nor to combine the peoples subjected to his influence into a system of nations strongly united together. I wish for no other proofs than that terrible Peloponnesian war, that fratricidal struggle, from which dates the decline of Greece, and the lamentable history of the Empire of Alexander and his successors. The Greek principle is individuality, and not association, and this is still further determined by the race, by the tribe; that is, by nature, and not by voluntary agreement.

This political and social work is a new work, and is entrusted to a new country and a new people. The centre of the civilized world again changes place; it takes a step further towards the West; its circumference enlarges; it embraces at once the South, the East, and the West. Rome, more skilled in the arts of conquest, and of establishing solid and durable political ties between the nations, combines in one and the same social net-work all the civilized nations of the Ancient World. The place she occupies in the very middle of the basin of the Mediterranean, seems to foretell that she is destined to become the metropolis of all the cultivated peoples who dwell upon its shores. This vast empire recombines the various elements of all the foregoing epochs in one and the same civilization, and the Roman

that new commandment, "Love one another as I have loved you," for ye are all brethren, and children of the same Father.

Thus, no more idolatry, no more servitude; for he liberated man from the yoke of evil that restrains the freedom of his moral being. No more thraldom; for that is incompatible with the rights of his brethren and with the love he owes them. No more national religions, opening between the nations abysses that nothing can fill up. All the nations of the earth must unite together in spirit, by the bonds of the same faith, under the law of the same God. This is the lofty goal to which henceforth all human societies ought to aim. The world hears the unity and brotherhood of all human kind proclaimed, without distinction of nation or of race — the true principle of humanity. This is the leaven that is to leaven the whole lump; it is upon this new basis that humanity, recommencing its task, goes on to build a new edifice.

But what people shall be charged with this immense work? Shall it be that old Roman society, wholly pagan still in its origin and in its forms, stained by slavery and violence, condemned long since to perish for its crimes? That body whose sap is gone, whose principle of life is exhausted, whose work is finished, — can it be born again? No, gentlemen, it is glory enough for the Roman world to have received and borne in its bosom this precious seed of the future, and to have shielded its earlier growth. The Church had her birth there, but the Christian world must needs bloom elsewhere.

This equilibrium of material forces is finally changed in the nineteenth century into a European concert. Europe gives to the world, for the first time, the spectacle of a family of states, so closely bound together that they are only different members of the same body. No longer united by material ties alone, they are already bound by spiritual ties. From the depths of Russia to the ends of England, from Sicily to Cape North, we find the same religion at the basis of the social condition of all nations. The old ideas are a common property; new ideas speed almost through this whole space with the rapidity of thought, and reach, at the same time, the understandings of all. The manners, customs, sentiments, become every day more alike; in all things, community and intimacy are closer and closer. Nothing that touches the smallest, the most remote of the members of the great confederacy remains foreign or indifferent to the whole.

And yet the assimilation of the people of Europe stops far short of confounding their distinctive qualities. Not long since, the world saw them, with some surprise perhaps, protesting against the complete fusion seemingly about to annihilate their individual existence, and threatening to carry them back to the chaos of a homogeneous unity. They have once again proclaimed the power of historical ties, uniting the offspring of the same people, like friends of childhood, by a long community of life, and the vitality of those elements of race which bear witness to the original diversity of the gifts the Creator has bestowed upon his children. Each of the great physical districts composing that continent, in

[illegible] a people whose moral and intellectual [illegible] talents, differ as much as their [illegible] those of their brethren. Each of these [illegible] in the great drama of history, a special [illegible] with its particular gifts, and all [illegible] in truth and reality, one of those rich [illegible] which we have recognized as being the [illegible] of a regular and healthy growth.

The variety of elements and their reciprocal influence, united to the community of action, which is the distinctive nature of modern society, exalt the powers of man to a degree hitherto unknown. Christian Europe beholds poetry, the arts, and the sublimest sciences successively flourish, as in the bright days of pagan Greece: but, enriched already with the spoils of the past, culture is far more comprehensive, more varied, more profound: for it is not only affluent with the wealth of days gone by, but Christianity has placed it on the solid foundation of truth. The spirit of investigation ranges in all directions; it adds to this brilliant crown a new gem, the science of nature, growing with a speed of which the Ancient World had not even a forecast. Unriddled by the spirit of man, nature has yielded up to him her secrets; her untiring forces are enlisted in the service of intellect, which knows how to guide their [illegible] its own purposes. Who shall describe th[illegible] applications of the science of nature, th[illegible] of the arts, each more marvellous than the [illegible] upon us with a daily surprise; those ing[illegible] mighty machines obeying without pause h[illegible] under his watchful eye accom-

plishing, with the same ease, the most gigantic works and the most delicate operations? The ocean has lost its terrors; with the help of steam the sailor braves opposing winds and waves; the compass and the stars conduct him with unerring precision to the end of his voyage. Space is annihilated by railroads; the word of man, borne on the wings of electricity, outruns in its course the sun himself; distances vanish, obstacles are smoothed away. Man thus disposes at will with the forces of nature, and the earth at last serves her master.

Such is the spectacle presented by European civilization. Looking upon it only under this brilliant aspect, and in itself, the progress of man seems to be almost touching its final goal. Nevertheless, the plan traced by the Divine Founder of the Christian church is much more vast; the goal which He sets up is much higher. These precious gifts of culture are not to remain the exclusive property of a small number of privileged men, nor of a single society, of one continent alone; the Christian principle is broader; it is universal, like the love of Christ. An important work remains, then, to be done; the work of diffusion and of propagation. This work is two-fold; for it is a duty to extend to the greatest possible number of the members of the same community all the blessings of civilization, at the same time that it is a duty to help all the nations of the earth to enjoy them. The first is social; the second pertains to humanity in general. To bring them both about, European society must overpass its present bounds.

Just as Greece, the model on a small scale of what all

adjusted to his forces, he has learned to subdue nature by intelligence, and has thrown off the yoke. The child of the East has become a man in the land of the West. Thus no obstacle dismays or arrests him; he sets forth, and, like the Rome of other days, the Europe of the present marches to the conquest of the world less by arms than by her colonists, her commerce, her civilization, and by the gospel, which she carries to all nations.

The first land her ships encounter is the New World, waiting, as we have seen, only for the active labors of the civilized races, to yield up to them all the treasures that lay unused in its bosom. The European nations bordering the Atlantic establish themselves there, and divide it among them. In North America, the people of the North of Europe — the Anglo-Saxons, the Germans, the French; in South America, the Spanish and the Portuguese. The contrast between the North and South, mitigated in the temperate regions of the mother country, is reproduced in the New World more strongly marked, and on a grander scale, between North America, with its temperate climate, its Protestant and progressive people, and South America, with its tropical climate, its Catholic and stationary inhabitants. The conquest of the New World was the fairest and the most useful the European communities could have made, both for themselves and for the accomplishment of their work. They are transported thither with all their means of action; they get the mastery of nature with-out having efforts; they strike their roots deep in a native soil almost untenanted; and America, while

Certainly these are admirable beginnings, the harbingers of a still more brilliant future. But here is only a part of the work the Christian nations of modern Europe appear summoned to execute. To this spread of the blessings of civilization abroad, ought to correspond, as we have said, a work of diffusion within civilized society itself; to the *humanitary* work, a social work. The greatest possible number of the members,— all, if it may be, — each, according to the measure of his gifts and the position assigned him by Providence, ought to share in the well-being, in the light of knowledge, in the moral perfection, which are now the portion of but a few. These advantages should, at least, be placed within the reach of all those, who, by a wise activity, the first condition of all progress, render themselves worthy to receive such reward.

This progress, whereto at present all civilized society aspires, — this goal, towards which it is tending, instinctively urged on by the very principle that constitutes its life, — is shown, as from afar, by that beautiful formula, drawn from the gospel, but so shamefully perverted by the false friends of progress, that one hardly dares repeat it after them; it is proclaimed in words that are the motto of the present age — *Liberty, Equality, Fraternity*. Yes, gentlemen, liberty to unfold all the living forces, and all the good tendencies of man, but not his evil tendencies; the equality of rights lying in the moral nature of man, but not that absolute, impossible equality which is contrary to nature and the course of Providence, and annihilates all progress; that fraternity which is the law of the gospel, and substitutes, for the

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whatever form the skilful gardener shall desire to give it. Is not this what has been done for modern society by Him who dresses the great garden of humanity?

Yes, gentlemen, a new work is preparing, and a grave uestion is propounded. To what people shall it belong) carry out this work into reality? The law of history plies, to a new people. And to what continent? The ographical march of civilization tells us, to a new con- ient west of the Old World — to America.

This conclusion may seem a bold one; for the future still covered by a veil it were unwise to wish to . Nevertheless, many signs seem to authorize this ticipation. It is worth the trouble of marking their stence, and of seeking to understand their language. What is that new people, forming and growing upon land of the future?

s it a new race? No; for the ties of race imposed by sical nature must disappear in that world of eman- tion and of liberty, to leave all its spontaneous racter to the activity of man.

it some particular nation of the Old World? No; f one people seems to stamp the physiognomy, yet historical nations of every language and of every acter are flowing thither, and blending together in nd the same nationality. The historical walls of ation in the Old World have fallen at once, and out a struggle. The European, who sets foot on ican ground, with the purpose of making it his ry, throws aside, at the threshold, not his affections is memories, but his social and political past — if r say it, takes a fresh start, recommences a new

Father — this is equality, independence, liberty. They submit from the heart to their Divine Leader, and to his law; this is the principle of order. Now the union of these two terms is free obedience to the divine will, which is the condition of a normal development, the supreme end of the education of man.

These, you will agree, gentlemen, are the sublime doctrines whence flow the religious, political, and social forms that distinguish America at the present time, from all the other countries on the globe. In religion, as in politics, democracy; the principle of free association pervading every part of public and private life; the preponderance of the judicial element set above the state itself, as the divine law is placed above human liberty; free obedience to the law, finally, rendering the means of constraint almost superfluous, and guaranteeing at once both security and liberty; — these are so many Christian ideas that have been incorporated in society, so many blessings America will continue to enjoy in proportion as she shall be faithful to the great principles whence they emanate.

A last characteristic, finally, of the nation forming on the soil of America, — upon which we fix our attention, because it furnishes in fact the representative of all modern progress, — is the greater emancipation from the dominion of nature. European society is transported to the New World, with all the power of modern arts and industry, which it applies without let or hindrance upon a large scale. Man, the master, now explores its vast territory. A perpetual movement, a fever of locomotion, rages from one end of the continent

to the other. The American uses things without allowing himself to be taken captive by them. We behold everywhere the free will of man overmastering nature, which has lost the power of stamping him with a local character, of separating the nation into distinct peoples. Local country, which had so great sway in the Old World, no longer exists, so to speak, beyond the limits of the city, itself an association determined by man's free will, and not by the force of external nature. The great social country wins all interest, and all affection; it overmatches entirely geographical country.

Such are the principal lineaments that give to this people a character peculiarly their own. By these features we recognize the people of the future; for all the tendencies, struggling hard to find a vent in European society, are realized without effort here, because they are the very foundations whereon all the social relations rest. It is to this people, then, that the full and entire development belongs in the course of the epoch now beginning.

And what continent is better adapted than the American, to respond to the wants of humanity in this phase of its history?

The nations of Europe might easily be drawn out and arrayed within its vast confines. Its fertile soil secures prosperity to all, in exchange for their labor. Its forests, its treasures of coal laid up in quantities surpassing everything of the kind to be found in any part of the globe, prepare an inexhaustible support, and allow a future extension of industry to a degree and in proportions unknown elsewhere.

The simplicity and unity of plan we have observed in its configuration, its extensive plains, navigable rivers, the extreme facility of communications universally, with no serious obstacle lying in the way, from one end to the other of the fruitful part of the continent, all invite the inhabitants to frequent connection, to never-ceasing intercourse and exchange, checking the formation of local nationalities, and favoring the maintenance of a national unity, by the assimilation of all the parts.

Thus we may, perhaps, foresee that the American Union, already the most numerous association of men that has ever existed voluntarily united under the same law, will be able hereafter to become, even within the limits of its present confines, a true social world, transcending in grandeur and unity the most impressive spectacles of human greatness the history of past ages holds up to our view.

Finally, the oceanic position of the American continent secures its commercial prosperity, and creates, at the same time, the means of influence upon the world. It commands the Atlantic by its ports, while Oregon and California open the route of the Pacific Ocean and the East. America, also, is so placed as to take an active part in the great work of the civilization of the world, so admirably begun by Europe.

e, then, gave the ancient world instruction
so Europe instructs and refines the modern
all mankind; and as Rome wrought out the
of antiquity, America seems called to do the
e for modern times, and to build up in the

all, by training them up to moral perfection, and by spreading the gospel throughout the world, to the glory of the Redeemer.

You see, gentlemen, this picture transports us into the future. *There* stands the goal, and we are only now at the starting point. But this lofty goal may serve as a guiding star for the present, to preserve it from losing its way. In what measure and through what perils it shall be given to mankind, and to America in particular, to attain it, is known to God alone, and future ages will teach the issue to the world; but what we do know is, that it will be in proportion as man shall be faithful to the law of his moral nature, which is the divine law itself.

Asia, Europe, and North America, are the three grand stages of humanity in its march through the ages. Asia is the cradle where man passed his infancy, under the authority of law, and where he learned his dependence upon a sovereign master. Europe is the school where his youth was trained, where he waxed in strength and knowledge, grew to manhood, and learned at once his liberty and his moral responsibility. America is the theatre of his activity during the period of manhood; the land where he applies and practises all he has learned, brings into action all the forces he has acquired, and where he is still to learn that the entire development of his being and his own happiness are possible only by willing obedience to the laws of his

es and prospers, under the protection of the
andman, the great tree of humanity, which

point of support for the establishment of easy and more rapid relations with all the nations of the world, and the irresistible logic of facts passing under our eyes, compels us to believe that during the epoch which is preparing, the boundaries of the domain of the civilized world can only be those of the globe itself.

Before closing let us cast back a glance upon the long way we have travelled over. The geographical march of history must have convinced us, if I am not mistaken,—

1. That the three continents of the North are organized for the development of man, and that we may rightfully name them preëminently the historical continents.

2. That each of these three continents, by virtue of its very structure, and of its physical qualities, has a special function in the education of mankind, and corresponds to one of the periods of his development.

3. That in proportion as this development advances, and civilization is perfected, and gains in intensity, the physical domain it occupies gains in extent and the number of cultivated nations increases.

4. That the entire physical creation corresponds to the moral creation, and is only to be explained by it.

Such, it seems, is the result of the study we have been making, of the relations between nature and

[illegible] is not, perhaps, without some surprise, that [illegible]vileged continents and races, continents and [illegible] unalterably smitten with a character of [illegible]nd yet, why be surprised at this? Is it [illegible]bute of God to dispense his gifts to whom he

portioned to the gifts they possess. To impart to other nations the advantages constituting their own glory, is the only way of legitimating the possession of them. We owe to the inferior races the blessings and the comforts of civilization; we owe them the intellectual development they are capable of; above all, we owe them the gospel, which is our glory, and will be their salvation; and if we neglect to help them partake in all these blessings, God will some time call us to a strict account.

In this way, alone, will the inferior races be able to come forth from the state of torpor and debasement wherein they are plunged, and live the active life of the higher races. Then shall commence, or rather shall rise to its just proportions, the elaboration of the material wealth of the tropical regions, for the benefit of the whole world. The nations of the lower races, associated like brothers with the civilized man of the ancient Christian societies, and directed by his intelligent activity, will be the chief instruments. The whole world, so turned to use by man, will fulfil its destiny.

The three northern continents, however, seem made to be the leaders; the three southern, the aids. The people of the temperate continents will always be the men of intelligence, of activity, the brain of humanity, if I may venture to say so; the people of the tropical ontinents will always be the hands, the workmen, th

as to be advancing towards the realization
, towards the solution of this great con-
orthern continent has its southern conti-

are far distant, indeed, from the point whence we started. Nevertheless, we have arrived hither, I believe, by a natural and regular path. Before we separate, gentlemen, allow me to add a few words upon the spirit and method that have animated and directed our studies.

All is life for him who is alive; all is death for him who is dead. All is spirit for him who is spirit; all is matter for him who is nothing but matter. It is with the whole life and the whole intellect that we should study the work of Him who is life and intellect itself.

This work of the Supreme Intelligence—can it be otherwise than intelligent? The work of Him who is all life and all love—must it not be living and full of love?

How should we not find in our earth itself the realization of an intelligent thought, of a thought of love to man, who is the end and aim of all creation, and the bright consummate flower of this admirable organization?

Yes, certainly, it is so. Faith so teaches, inspiring us with this sentiment, vague still, yet profound. Science so teaches by a patient and long-continued study, reserving this sublime view as the sweetest reward for our labor. Faith, enlightened and expounded by science,—the union of faith and science,—is living, harmonious knowledge, is perfected faith, for it has become VISION.

I have sought, gentlemen, to introduce you to the
ledge of our globe, in the modest measure
me to do it. In spite of the imperfec-
nowledge, of which I feel that I have onl-

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